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A THEORY

OF

CHEMICAL ACTION AND AFFINITY

Hail
3-PLD

"For the purposes of instruction or argument it may be convenient to assume ISOLATED matter; many conclusions so arrived at may be true, but many will be erroneous."—Grove's "Correlation of Physical Forces."

"Chemical Affinity . . . is that mode of Force of which the Human Mind has hitherto formed the least definite conception."—Grove's "Correlation of Physical Forces."

"We are struggling toward a Chemical Theory. Such a Theory we do not possess."—Prof. Crum Brown's Address before the British Association, 1884.

"La théorie est non seulement utile, mais encore indispensable au Chimiste; c'est le phare qui le guide vers l'inconnu. . . . Mais il faut bien le reconnâitre et l'avouer ce phare est encore incomplètement éclairé, et ne peut servir qu' a courte distance."—Schützenberger's "Traité de Chimie Général" (Introduction), 1880.

"Die chemischen Erscheinungen sind . . . nach äusserst complicirt. Der theoretischen Forschung ist es bisher nur *unvollkommen* gelungen sie tiefergehend zu zergliedern."—Graham-Otto's "Chemie," 1885.

A
CORRELATION THEORY
OF
CHEMICAL ACTION AND AFFINITY

BY

THOMAS WRIGHT HALL, M.D.

> "Thus DAYLIGHT being the initiating force, we get *chemical action* on the plate, *electricity* circulating through the wires, *magnetism* in the coil, *heat* in the helix, and *motion* in the needles."—Grove's "Correlation of Physical Forces."

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PREFACE.

EXPERIMENTS abound and multiply in Chemistry—and Practical Chemistry therefore is amply safeguarded, or all prospering and to prosper. But the latest and the best authorities declare that to this hour there is no Theory for Chemistry—and by no means certain prospects of any. For a Theory is unpopular and difficult; a theory has to be judged and misjudged; has righteously long to struggle for existence even if fated to live—hence a Theory, though good or viable, is likely to be not only breadless and honourless, but also thorny to its living Author. And the living Theorist in Chemistry therefore, at best, succeeds only in planting himself or his Theory on the Pillory of Science; and, must take all, bear all, and ask nothing but the supreme rapture of his Theme or Cause. Consequently, while the brilliant, remunerative Practical Chemistry is all fondled and all triumphant, the pelfless, sphinx-like Theoretical Chemistry is belated, unsought, a lasting forlorn hope of Science. In this indefinitely prolongable lack of Betters, and for the lifelong love I have borne to all Chemistry, and though the humblest of sciolists, I now offer A Theory of Chemistry. And by Theory I mean a chain of connected and related thoughts, interpreting the forces and actions of Chemistry without Procrustean hypotheses, or as far as possible by experimental or observed facts, or *veræ causæ*. And by Chemistry I understand that Power on Earth which forms and transforms matter, amid more or less of Fire and its cognates or correlates, and amid the gravities of the Earth-globe.

This Theory or Philosophy of Chemistry therefore is but Thought, guided by experiment and observation, brooding over the Form of matter; brooding over Fire and its correlates; brooding over the gravities or the Pressure Force for matter—over each by itself and over All conjointly together in their mutual relationships. In short, the leading Themes in this Chemical Philosophy are—Gravity and Fire, as molecular Forces; and Matter's Form, or Matter's Plasticity to those Forces. And the leading thought in this Chemical Theory is that Fire Force is oscillatory motions in Ether and matter, and that the Form in matter is also oscillatory motions in matter and Ether. Moreover, the Forms and the Fires and the Pressures examined by our observation and by our thought, are by no means those of Man's making and unmaking merely, or solely those prompted by Artificial chemistry, but likewise the Forms, the Fires, the Pressures, that Nature's Chemistry knows how to create and to use. In our Chemical Philosophy, therefore, we do our little but our best to enthrone the cosmical, the enduring Chemistry of Nature, beside and above the local, the passing Chemistry of Art. And we have asked the two Sister chemistries to interpret each other for us. In other words, I have tried to view Chemistry and its Forces and its Actions, not only locally in piecemeals and in laboratories, but as wholes, and as wide wholes, or throughout Nature also. I have not shrank from taking new views of old and common things. And standing under the mercy and correction of Pillories, I will go counter to opinions even of long, wide, firm, prescription, if I consider myself backed by strong facts. For by new, fact-founded views, alone, and by a wholesome Pillory or by the free discussion of those views, can a Theory for Chemistry be well grounded and advanced.

Lastly, I add, that prizing and therefore adopting laconic conciseness, I yet utterly disclaim its seeming dogmatism; and because I have struggled single-handed, with many and great difficulties, I claim allowance around my Pillories for many and greater shortcomings.

Bahia, 2nd February, 1888.

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CHAPTER I.

SCOPE OF CHEMICAL FORCES.

THE Theorist in Chemistry ignores to this hour Forces that jostle and crowd around Her. He overlooks the Forces in the Earth-globe, in the Sun, and in the Starry Universe; and He is content to see Forces only in his tiny Laboratory, and there to worship an Atom. In this Laboratory spot present chemical Theory imprisons chemical Thought. To a viewless, tiny, questionable Atom Theory fetters the unquestionable, the enormous Forces of Chemistry.

But we have been led to think otherwise.

We apprehend that the tiny Laboratories and the tinier Atoms and Molecules are insignificantly small and weak, and are as unfit to be the sole centre of chemical Phenomena and Thought, as the tiny Dust-speck called the Earth-globe was unfit whilom to usurp the centre of astronomical Phenomena and Thought—the centre of a Universe. And we submit that there is little hope for chemical Theory until we trace the Forces and movements of chemical Actors to similar Forces and movements seen to be present and active in a Nature which consists not only of Atomies, Molecules, and Laboratories, but also of the Earth-globe, and of its Sun, and of that sun's Starry and Planetary Universe. As the essential, ultimate Forces and movements of acting Atomies of Matter in Chemistry are those of Heat and of Form change, we try to maintain that it must be other fires that kindle the fires or the heats of chemistry, and that it must be parent or elemental forms that breed her form changing, her new forms and compounds; for neither Fire Force nor Form Force can be created or totally extinguished.

The pressure Forces of Gravities, and the shine Forces of the Stars, and of the Sun, and of the Planets—in other words, the graduated pressure Force and the graduated photothermal Force, namely, plus and minus Weight, plus and minus Heat and Light—heaviness and lightness, Light and Heat, Cold and Shade, the sidereal Fires or Shines, and the planetary Fires or Shines—exist throughout the Earth-globe and the Universe, and for All things, and, therefore, also and indeed more specially for Chemistry, and most specially for Cosmical Chemistry.

In chemical Action, that is, in the formations and in the transformations of Matter, our Theory will maintain that the acting Atomies and Molecules are kindled and are formed and transformed, because there are throughout Nature graduated Fires to light the acting Atomies and to heat them into transformations; and because there are also graduated Gravities that help to press them into their shapes. Force, therefore, for our Theory originates, in Chemistry at least, by no local clashings of Atomies, and in no local Laboratories; nor is Force confined to either. Force sweeps through the Atomies of chemical Actions, through their Laboratories, through their Earth, through that Earth's Sun, and to that Sun's Starry Universe, and back again, or in cycles, or potentially for ever and ever—for the Whole Universe is

One. Hence the Forces present and seen in some chemical Actions appal us with their majestic violence, for they have links that, though tiny, are in the chain of the World and of the Universe.

In philosophizing on Chemistry, therefore, we despair of the atomic Theory in Chemistry, for we abandon the Atom as the central Force and Thought of Chemistry; and we forsake the Laboratory of art as the centre spot in Chemistry; and, instead of worshipping the viewless and hypothetical Atom, we question Nature and common Things; we take Gravity and the real Fire of the shining Orbs that we find teeming in Nature as the most central Forces of Cosmical, and ultimately also of Local, Chemistry; and in lieu of the Laboratory spot alone, we restore also the World and the Universe to Chemistry for a dwelling. I try, therefore, to discern Chemistry from novel aspects; I study to obtain a wider scope and outlook for chemical Phenomena; I do my Little, but my Best, to found a broad correlation Theory of chemical Action and Affinity.

CHAPTER II.

FORM AND FORCE IN CHEMISTRY.

I OFFER the rough Rudiments of a Theory of chemical Action and Affinity. And because the most constant and the most characteristic Phenomenon of Chemistry is the Form changing in Matter, or the making and unmaking of the Form in matter, I bring forward FORM as one of the chief centres of Thought and importance in that Theory. And the Forms I treat of are those of Solidity, Liquidity, Gaseity, in Matter and their Allotropies. For the Solidity, the Liquidity, the Gaseity belonging to the Planet Earth has each within itself very many Pitches or variations, which I consider their Allotropies. And I study specially these four qualities of Form, the Solidity, the Liquidity, and the Gaseity of Earth-matter, and their Allotropies or Pitches, because Matter never escapes from one or other of these Forms or Pitches of Form; not even by chemicalization, or by chemical Action and Combination. Chemicalization can only gasify or liquefy or solidify matter, or can only allotropize or alter the pitches of already existing gaseity or liquidity or solidity of matter. All chemical Actions and Combinations must end in solidifications, or in liquefactions, or in gasifications, or in their allotropizations, or in a pitch change of these States of matter. Hence Solidity, Liquidity, Gaseity, and their Allotropies or Pitches are for Chemistry, the Pith and Marrow, or the Quintessence of form. And as such they are the most important as well as the simplest and the most comprehensive Forms in Chemistry. And those Forms shall be called, in this Theory, the Quintessential Forms. But I study those Forms not only because they are quintessential and comprehensive, but also because they exist in Nature, and nature made or native, as well as in the Laboratory and artificially-made. And both as Natives and as Artificials they are equally important. Moreover, I study those Forms because we know the Forces that make and unmake those Forms as artificials in the Laboratory. And we may, therefore, obtain from Art some clue to the Forces that make and unmake the similar or the native Forms in Nature.

For example, the stable gases that we find native, or that are made or kept made by Nature—Hydrogen, Nitrogen, Oxygen, Chlorine, etc.—can all be artificially liquefied or solidified.* These natural gases, therefore, are originally or potentially solid matter. How came, then, these potential Solids by their natural Gaseity on this Earth? Or how has Nature made these Solids into native Gases? The solids that we find existing naturally on this Earth may be very fusible and volatile, or may be potential gases. How come such volatile solids then to keep themselves ungaseous or solids on Earth? On this Earth, therefore, Nature has to keep Matter that is originally or potentially solid, gaseous; and Nature, on the other hand, has also to keep Matter that is potentially gaseous or very volatile, solid. How does Nature do it? She must have two distinct and seemingly antagonistic powers—a power to check the native solids that would or might be gaseous; a power to check the native gases that would or might be solids. What are these two powers? That is the vital Question—that is the vital Secret of Chemistry; and their solution leads out of Doubting Castle into the Theory of chemical Action and Affinity.

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* Wroblewski and Olzewski, "Popular Science Magazine" (New York).

These two Problems that are presented to Nature have been solved by Chemists or by art; for in the Laboratory the Chemist can keep all gases solid if He cool and press them enough; and conversely the Chemist can keep solids gaseous if He heat them enough, and lighten them enough from pressure.

The artificial Forces, therefore, that make and unmake the Quintessential Forms in the Laboratory are plus Heat and minus Heat or Cold, and plus and minus Pressures; in other words, the artificial, the man-wielded, quintessential morphigenic Energies are Fires and Freezing Mixtures, with Pressings and Unpressings brought to bear on Earth-matter that is more or less plastic to them.

But Nature is not to be outdone by Man or Art; and if the Chemist has in his Laboratory his plus Heat or his Fire, and his lightened or minus Pressure, so has Nature in her vaster Laboratories her greater Fires or Shine-powers from the Radiations of the Sun and the countless Star-suns; and Nature obtains her lightened or her minus Pressure by the lightness or the minus Gravities in her Matter.

And as the Chemist has his minus Heat or his Cold, so has Nature also her own intenser minus Heat or darker Heat, or Cosmical Cold, that is drawn from the Planetary, darkershine powers of the matter of our greatest Chemical, the mean Earth: and Nature's plus, or stronger Pressures she obtains through the heaviness or the plus Gravities of her matter. The natural plus and minus Pressures, the natural plus and minus Heat and Light, in short, the natural Morphigenic Energies for the making and unmaking of the natural Quintessential Forms are most constant, most powerful, most Cosmical, and in so far only are they unlike the Energies of art. And Nature's means of using these, her Morphigenic Energies, consisting of the Graduations of the Pressure Force, and of the Graduations of the Photothermal Force, are no less perfect than the Forces themselves. For Nature has made Matter plastic to the Graduations of the Photothermal force, and of the Pressure force in many pitches or shades of degrees—by matter's Weights, Thermal capacities, Plasticities, Conductivities, and Radiations, or shortly by matter's chemical or morphigenic Characters. To each of the many qualities of Matter, for example, to each of the chemical Elements, or parent, or stock Forms, Nature gives its special chemical Character, an elemental Character belonging to it as a form or chemical Parent, which may be much modified in their offsprings or compounds, but which remains as a Strain that is never quite lost. For Nature can combine or blend together Matter with other Matter, Element with Element, Character with Character; and by blending or wedding matter with matter, and character with character, offspring matter or compound matter, or new quintessential forms, arise; in short, Chemistry arises, even if Nature's Morphigenic Energies be uniform for all Earth-matter, and remain unmodified. For it follows that though Nature's Cosmical Morphigenic Energies be uniform for all Earth-matter, still, as the morphigenic or chemical Character is and can be farther varied in matter, *that matter* can assume, even by uniform Energies, many Quintessential Forms, and thereby Chemistry is born, lives, and thrives.

CHAPTER III.

FORM, FORCE, AND CHARACTER.

For if Chemistry be the fiery and transforming Power for the matter of the Earth, He is no good Theorist in Chemistry, who ignores or even underrates Fire and Form in Chemistry and their close Relationship to each other.

And in truth, at the Dawn of chemistry, or on first looks and fresh Thoughts of chemical Phenomena, the yet ungrooved chemical Theory did, indeed, specially busy itself with Fires and Transformations, those wonders and riddles of chemistry. But then the early Theories made the chemical Fires into the fanciful Phlogiston; and the chemical Transformations Theory turned into Transmutations, and went astray with Greed and Alchemy. But although Phlogiston is for ever quenched in all Chemistries, still the *Fires* of chemistry burn on for all time and all Chemistries. And although Transmutations in matter be quite unknown to Chemistry, its *Transformations* still revel constantly both in and around us. And not only so, but more or less of Fire, or Heat, and Transformations are inseparable or always go together in Chemistry; so that all chemical Actors act or transform in Equivalent proportion, which is inversely their heat or fire capacity. For the

Equivalent is now known to us—though not in Dalton's time—to be a thermal or fire Attribute in matter. And being but an attribute in matter, the Equivalent cannot be put for the Atomy of matter itself; as Dalton, in his half knowledge, was justified in proposing. And the Equivalent is, indeed, all important in chemical Actions not because it is a matter Atom endowed with hypothetical and procrustean powers, but because the Equivalent is actually an important fire Attribute of matter, and because Fire or Heat plays a most important part in every chemical Action and Combination; chemical Action being a photothermal or fire action in matter. And one of the leading Principles of this Theory is that not only is the Equivalent or thermal Capacity in matter important in chemical Action and Combination, but that thermal or fire Plasticity, Radiation, Conduction in matter are highly important also. In other words, the more complete photothermal Character of matter, that is, the Equivalent or thermal Capacity, the thermal Plasticity, Radiation, Conduction of matter, taken both collectively and singly, are also of most essential importance in Chemistry; in every matter Formation and Transformation, or in every chemical Action and Combination, or Chemicalization.

Again, in the Universe all matter gravitates. Matter attracts matter towards centres of gravitation, and according to the mass and distance of attractors. And these centres of gravity may be local, as in specific gravities; or Cosmical, as in unvarying weights. As long, therefore, as there is a Graduation in the weights of chemicals, there will be a graduation in the local and Cosmical gravities' Pressures on the Quintessential Forms of chemicals. And in judging of the Quintessential Forms in matter, its Weight, thermal Capacity, Plasticity, Radiation, and Conduction must, at least, be known and singly and collectively taken into consideration. For we shall find that the Quintessential Form in matter is a varied oscillatory Balance of Contractions and Expansions in matter, and produced by more or less of the pressure of the Gravities of the Earth, and by more or less of the Fire-might of the World.

CHAPTER IV.

FORM MORE FULLY CONSIDERED.

From the Forms with which this Earth teems, therefore, we abstract while theorizing on Chemistry, the Quintessential Form—the forms of the Cosmical Solidity, Liquidity, Gaseity, and their Pitches or the allotropy-like Changes, produced within each of these physical states, by the variation in them, of density and state change points, etc. This abstract Quintessential Form is the central form of the Cosmical Chemistry, and embraces and abstracts the Whole Matter belonging to the peripheral Earth globe, and classifies that matter in a wide gamut of pitches, or in a homologous Scale-like series—beginning in a Solidity that has a low, or a dense, or a hard and badly fusible pitch or allotropy—from which the abstract Quintessential Form rises in pitch into Solidities that get lighter, and softer, and more fusible. Then the Form pushes up still higher in Pitch; and then the Solidity merges into the denser and more solidifiable abstract Liquidity. And the Form still continuing to rise, attains the lighter and more volatile, or higher pitched Liquidities, which then approach the pitch of abstract Gaseity itself, and finally actually reach it, in Gaseity's denser and more liquefiable or lower pitches.

And from the low pitched Gaseity the Quintessential Form leaps up and ends in the rarest and the least liquefiable of the Gaseities of Earth, which goes by the name of free Hydrogen; somewhat like the Homologous Series of organic compounds.

Forms of this Quintessential abstract type may be conceived obtainable from one abstract ethero-molecular matter, as from a primordeal shape Contraction or Solidity, by grafts of an ascending gamut of Expansion, in oscillatory balance with the Contractions of Solidity. Or on the other hand, from a primordeal shape Expansion or Gaseity, by grafts of descending gamuts of Contractions, in oscillatory balance with the Expansions of Gaseity. Primordeal ethero matter being one, and its expanding and contracting or oscillatory pulsations, its form and colour pulse Pitch, being alone scalariformly changed. And such form-pulses' Change sufficing to allotropize matter, that is, sufficing to make one quality of ethero matter by pulsating in varying pitches assume changing, related aspects, like the note pitch in a scale of music, or like the refrangibilities or the Rainbow colours of the Spectrum.

No Matter escapes on Earth from this type of Formation, it is the skeleton of all the forms of chemistry, or it underlies every Form. Hence we have called it the Quintessential Form; the Pith form of matter and of chemistry. And although the primary Forms in chemistry be resolvable into Three only, namely, Solidity, Liquidity, Gaseity, still, like the Three chief notes of Music, like the Three chief colours of Light, these Three Forms can be allotropized or pitched into many composite or allotropic Forms, after the manner of the Homologous Series in organic compounds. And the Compass of Quintessential Form is thereby as large as the Compass of Music notes, or of the coloured Lights; and the Compass of all Three, Light or Colour, Music and Form, are intimately analogous to each other. When such a view is taken of the Form in Cosmical Matter, it becomes possible to consider Ethero-Matter as one, and the shine or the fire Force as one, and as a Spectral Force or as a Gamut of ethereal oscillatory or pulse motions, acting or radiated on ethero-molecular matter. Shine, Music, and Form and Colour Pulse, in matter become resolvable by the mind into allied oscillatory Scales of pitch motions in allied matters.

CHAPTER V.

THE GASEOUS NATIVE FORM AND ITS FORCE.

THE four chemical Elements or Quintessential Forms of matter, Hydrogen, Nitrogen, Oxygen, and Chlorine, are potentially solid bodies, existing, however, here on Earth, stably in the gaseous state. Press the gaseous shape of Chlorine, at common temperatures, with about five atmospheres' pressure power, and the shape contracts to liquefaction. But at common temperatures the gaseous shapes of Hydrogen and Nitrogen resist unliquefied 2,790 atmospheres' pressure power, and Oxygen's shape, 1,354; * and it is only at a temperature or cold of minus 140° centigrade, and at 600 atmospheres' pressure, that Hydrogen's gaseous shape contracts to liquefaction, and Oxygen's at 320 atmospheres; while Nitrogen's shape yields to a pressure higher than Oxygen's pressure.†

By the above Facts, I submit that it is demonstrated: *First.*—That there is a great Force present in each of these gaseous Forms. *Second.*—That this Force, although the same in quality, yet varies in amount between each of these four gaseous Forms. What is this great force in these four gaseous Forms of Hydrogen, Nitrogen, Oxygen, and Chlorine? And how shall we name the Force in chemistry as about to be discussed in this Theory? For this great Force is going to occupy a great place in our Theory of chemical Action and Affinity.

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* Tyndall on "Heat," p. 144.

† Schützenberger's "Chimie Génerál," Vol. I., p. 40.

And First.—This Force may be viewed in a purely mechanical aspect, and then the Force is simply mechanical expansion force in those four gaseous Forms; because it is a Force that can there be overmastered and measured by simple mechanical pressure force; and because it is a Force that in these four gases has expanded Solidity or Contraction into Gaseity or Expansion.

And Second.—This Force may be contemplated from purely chemical aspects; and the Force must then be held to be correlated to matter's Quintessential Forms, or held to be Morphigenic or Form-making Force; because you cannot overcome this Force in any of these four gases, without also overcoming the quintessential form of Gaseity or its Pitch in them; and because it is a Force that has changed the form of Solidity originally and potentially present in those four elements, into the Form and Pitches of gaseity in which they are known, or in which they stably exist on Earth.

And Third.—This Force may be considered simply as latent heat in these four gases—Hydrogen, Nitrogen, Oxygen, and Chlorine—because it is a Force that is there quenched or over-mastered, and measured by simple cold,* and restored by the simple heat of the earth's Cosmical Shapecraft.

And Fourth.—This Force may be regarded in its complex totality, and then it shall be a Morphigenic Heat Force, the epithet morphigenic alluding to the force's shape and shape-pitch producing characteristic; and the term force referring to the force's alliance with the mechanical expanding powers; and the word heat recalling the force's relations to the thermal force—that is, the force's analogy to the latent heat of *Black;* for Hydrogen, Nitrogen, Oxygen, and Chlorine, being all solidifiable bodies, or being potential solids raised to the state of gases, must contain in them a natural gaseity producing force, analogous with the latent heat-force of Black in artificially gasified solids.

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* Wroblewski and Olzewski, "Popular Science Monthly Magazine" (New York).

We note, therefore, in what I will call the Morphigenic Heat Force of these four gases—Hydrogen, Nitrogen, Oxygen, and Chlorine—three correlated and quite inseparably-associated Characteristics —

First.—Varied Pitches of expansions or of expansibilities;

Second.—Varied Degrees of latent-like Heats;

Third.—Varied Quintessential Forms: varied Pitches, Allotropies, Densities, and State change Points in a Gaseity common to all these four Elements.

These four elements—Hydrogen, Oxygen, Nitrogen, Chlorine—are exceedingly-heated elements; and the proof is that it takes a very great deal of cold to cool them of this heat or to freeze them into solids. These four Elements are exceedingly-expanded chemicals; and the proof is that by far the least expanded of them—the Chlorine—four atmospheres' pressure cannot contract into liquefaction; and the most expanded of them—Hydrogen—thousands of atmospheres' pressure fail to contract to liquefaction. Moreover, these four elements—Hydrogen, Nitrogen, Oxygen, and Chlorine—are immensely heated and expanded, by a heating and an expanding power which is perfectly natural and uniform for all, and in which we ourselves exist ungasified and at ease; the chief reason of this being that We and the Four Gases have each our own special chemical Character, and *none* of the Five of Us, therefore, can take neither the Cosmical Heat nor the expanding Force found uniform in Nature, to a like degree.

CHAPTER VI.

THE SOLID FORM AND ITS FORCE.

On the other hand, the two Elements or Quintessential Forms of matter, Sulphur and Potassium, are both volatile, or are two potential gases, existing, however, here on Earth stably in the Solid form. Heat—that is, expand Sulphur with 440 degrees of heat or molecular expanding force—and Sulphur's Solid shape boils or expands into Gaseity. But at 440 degrees of heat or molecular expanding force Potassium's shape resists boiling or gasification, and requires a red heat before it is boiled or expanded into Gaseity. In Sulphur and Potassium, therefore, there exists also a Force the same in quality in both, yet different in amount in each—a Force, however, the opposite to that found in the gases—a force that may be viewed:—*First.*—In a mechanical aspect, and then it is Contraction force; because it can be mastered and measured by Expanding force. *Second.*—The Force may be viewed in a chemical light; and then it is correlated to the Quintessential Form in matter; because you cannot overcome the force without also overcoming the Solidity form or its Pitch in matter, by expanding it into some allotropy, or by liquefying it, or by gasifying it. *Third.*—The Force may be considered latent Cold in these two Solids, Sulphur and Potassium; because the force can be overcome by Heat and restored again by the Cold found on Earth. *And Fourth.*—The Force may be viewed in its complete totality, and then it shall be a Morphigenic Cold Force; morphigenic alluding to the force's shape and shape-pitch producing Characteristic, and the term Force indicating the force's alliance with the mechanical contracting powers; and the word Cold recalling the force's relations to the thermal force, or its analogy to the latent cold of Black. For Sulphur and Potassium, being potential gases in a contracted form, must have in thema natural freezing or contracting, or solidity producing force analogous to the latent cold in artificially solidified chemicals. We note, therefore, in what I will call the Morphigenic Cold Force of these two solids, Sulphur and Potassium, Three correlated and quite inseparably associated Characteristics. *First.*—Varied Pitches of contractions or contractibilities. *Second.*—Varied Degrees of latent-like colds. *Third.*—Varied Quintessential Form—varied Pitches or Allotropies, Densities and state-change Points, and Hardness in a solidity common to Sulphur and to Potassium. These two Elements have both the solid form; but each has its own pitch of solidity, or its Density and State-change Point, and its Hardness; and each has, therefore, though alike solid, a different aspect from the other, or has an allotropy in the *cosmical* solidity. In other words, these two elements, Sulphur and Potassium, are cosmically frozen or cooled elements; and the proof is that it takes a great deal of heat to unfreeze, or to melt and to boil them into steams. These two Elements are contracted; and the proof is that 400 degrees of expansion force, or of heat, cannot thaw or expand sulphur into gasification, and sulphur is the most expansible of these two solid elements. These two elements, Sulphur and Potassium, are cooled and contracted, by a cooling and contracting power, that is natural and uniform for all, and in which We and the Four Gases just considered exist stably less solidified; the reason of this being that We, the Four Gases, and the Two Solids, have each our own special Character, and *none* of the Seven of Us, therefore, can take in a like degree neither the Cosmical Heat nor the Cold, nor the Expansion nor Contraction, found uniform in Nature.

CHAPTER VII.

THE CHARACTER OR THE PLASTICITY OF MATTER TO FORCE.

In studying the Quintessential Forms and Forces of the chemical elements, we conceive them to be subjected, on this Earth to a Cosmical Morphigenic Energy—a Greekism which it were better, perhaps, to translate into shorter, plainer English, or to turn into—the *Shapecraft*, roughly consisting in its ultimate essentials, of the Sun and Star Shine powers, which together make the Sidereal Shine powers, and of the Earth or the Planetary Shine powers; both the *sidereal* and the *planetary* shine powers being found in the Common dayshine and nightshine; the *Shapecraft* also including the Local and the Cosmical plus and minus Gravities or Weights for Matter.

The Sidereal and Planetary Forces of the Shapecraft are, therefore, Two in ultimates; but the Two is always a united or polar Two that never exists asunder. As long as there are Suns and Planets in the Universe there will be inseparable Sidereal and Planetary Forces in polarity in Nature. Moreover, these two forces oscillate, or one comes as the other goes, and oscillate while meeting each other. Both the Suns and Planets give and take mutually, or in oscillations, forces from each other. The forces, however, that one furnishes to the other are different and complementary or reciprocating to each other. The Planet gives to the Sun in oscillations, the minus, the negative, the cold, the contracting force, and takes from the Sun selfwards, the vivifying, the plus, the positive, the hot, the expanding force. The Sun gives to the Planet in oscillations, the vivifying, the plus, the hot, or expanding force, and takes from the Planet selfwards, the negative, cold, contracting force; and the Sidereal and Planetary Action and reaction are always oscillatory and mutually complementary. And in those Sun and Earth, Star and Planet Oscillations lie the Forces of the Shapecraft of Chemistry, or of this Earth; lie the thermal Life of the Particles of the Earth, and, indeed, of the whole Universe.

As long as Molecular Matter has the chemical Character, and while in the Earth's Shapecraft, Sidereal, plus sunshine Powers oscillate with Planetary minus earthshine Powers, there will arise the sensible pulses of photothermal force in the Earth's Ether, together with the expanding and contracting oscillatory pulse in etheromolecular matter itself, called the Quintessential Form in matter—a form and colour-pulse made by the Morphigenic Heat and Cold Force in chemicals themselves, and ultimately by the Shapecraft itself through matter's Character.

But as at this stage of our Theory it simplifies our reasoning, or the conception and description of chemical or shape-making Phenomena—if Cold and Heat be regarded as differing, abstract, material Entities—we, in the meanwhile, and, indeed, whenever convenient, view or describe them as such.

The effects of all heat and cold, Cosmical and Local, and of latent heat and cold, on matter's Quintessential Form, are brought about chiefly by eight attributes in matter —

1. By heat capacity in matter.

2. By heat dilatability in every sense, but most specially as measured by the form and form pitch, or by the forms and the forms' ascending state-change points.

3. By heat conductivity in matter.

4. By the radiation for the plus, the high-pitched heats, which are *intrinsically* the brighter, the more luminous heats of nature.

5. By the cold capacity in matter.

6. By the cold contractility in all senses, but most specially as measured by the form and form pitch, or by the state and the descending state-change points in matter.

7. By the cold conductivity in matter.

8. By the radiation for the minus or low-pitched heats, which are virtual cold, or *intrinsically* the darker, blacker heats of nature.

These eight photothermal Attributes in matter are strikingly Chemical, for they all more or less influence, directly or indirectly, matter's Quintessential Form. The Cosmical Heat and Cold Capacity in the elements or chemicals we assume to be much the same as their common or local heat and cold capacity; and to be indicated by one of their Equivalent of Substitution Numbers, Hydrogen being reckoned one; for Hydrogen has the first heat capacity of all the elements. Carbon comes next best in capacity, and is three; Nitrogen next, and is 4·7; then Oxygen, 8; Phosphorus is 10; Chlorine, 17·7; Arsenic, 25; Antimony, 40; Platinum, 99; and so forth.*

The Cosmical Heat and Cold Plasticity is similar to the local; and is indicated greatly by the form in which chemicals actually occur, and by that form's pitch or its hardness, its density and ascending and descending state change points.

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* Schützenberger's "Chimie Général."

The Cosmical Heat and Cold Conduction in matter is similar to the local and to the electric conduction.

The Cosmical Radiation is similar to the local, as determined by Melloni, Tyndall, and others; and is also seen in the wave lengths and beats of the spectral lines of each element, as given by Schützenberger.*

What boots, therefore, for chemical Theory to know in the Character of the Elements or Chemicals, and to consider singly and collectively, is:—

1st. The elements' Equivalent of Substitution Number, because that indicates *Cosmically* the elements' heat and cold Capacity.

2nd. The Elements' Form and form Pitch, or its State, its Density, Hardness and Softness, and its ascending and descending state change Points; because the form and form pitch greatly indicate the elements' plasticity to local and to Cosmical Heat and Cold: its Expansibilities by all Heats, and its Contractibilities by all Colds.

3rd. The elements' local heat and cold conduction, or its thermal conduction, as showing the Cosmical Conduction.

4th. The elements' local dark radiation, and also its bright radiation, as given by Melloni, etc.; its minus and its plus radiation, or its spectral lines in waves lengths, as given by Schützenberger, as indicating the Elements' Cosmical Radiation.

5th. The elements' Weight, representing the action of local and Cosmical Gravities or pressing Forces on its Quintessential Forms.

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* Schützenberger's "Chimie Général."

CHAPTER VIII.

THE MOLECULAR CONSTITUTION OF MATTER.

ALTHOUGH in the Cluster of bodies called the Solar system, the Globes of the sun, of the planets, and of the moons seem large and far asunder, still, compared with the Whole Matter, and the Whole Space of their integral Universe, the Globes of the sun, planets, and moons are infinitely small and infinitely near. In other words, if you take the Whole Universe as One—or as an Unified vast spheroidal mass of matter—then the Globes of the stars, sun, planets, moons and Their Spaces of Separation become so dwarfed and small, that the Globes may be held to the ultimate Particles, and their Separation Gaps, the ultimate Pores, of the spheroidal matter of the Whole Universe; and the Matter scattered throughout the vast spheroidal mass of the Universe, and the matters' arrangements, may represent and illustrate the matter scattered throughout the tiny spheroidal mass of the Planet Earth and that matter's Arrangements. For the Tiniest Drop counts closest kindred with the Vastest Oceans.

The Matter throughout this One Universe is arranged in Agglomerations of several sizes and densities, surrounded by pores or gaps filled and unified by the all-pervading, all-permeating, all-penetrating Ether. The smallest masses in the matter of the Universe are the Globes of the stars, of the sun, and of their planets and sub-planets. These Globes, are, therefore, as the ultimate Particles or the Atomies of the Matter of the Universe, and are never single but in Agglomerations, called Solar and Planetary Systems. In such Systems, the Globes of the sun and planets are bound up by their Orbits into fragments of Spheroidal shapes, analogous to the shapes of the Globes or atomies themselves; and a solar system is, for us, an ultimate *molecule* of Universe Matter. The matter of the Universe is agglomerated in still larger, looser size, in the sidereal Systems of Double or Multiple stars, in which two or more solar systems or *molecules* of Universe matter are shaped and joined together more immediately into one ultimate *cluster* of the Universe matter. The matter of the Universe is agglomerated in still larger, looser shaped size in the Nebular System of stars, in which many Atomies, many Molecules, many Clusters of Universe matter, stars to stars, suns to suns, with all their long array of primary and secondary planets, are grouped into vast, magnificent Masses of Universe matter, into vast Galaxies of Heat and Light. Lastly, although the limits of the Universe be unfathomable even by Thought, yet we may gather dimly the Loom of its matters' shape. For the *atomies* of Universe matter other *starry dust* from which the Whole Universe is made, is packed in *zones* or *girdles;* and if we imagine the Universe a vast Sphere, then it would be an oblate Sphere, having an accumulation of matter towards its Equator; the vast Universe having consequently somewhat of the form common to its atomies, to its molecules, its clusters, and masses; and the Shape of the vast Universe becomes comparable to that of the tiny Earth globe.

The Matter throughout the Universe, therefore, consists of comparatively small Atomies, leaving Spaces or Pores between them, filled everywhere and unified with Ether. But these Atomies are never single or independent; but the Whole Universe is One; and its Atomies are arranged in Systems, regularly but at a very great variety of distances from each other. In the production of these Shapes, Systems, and Spaces in the matter of the Whole Universe, astronomical Gravity or a Centripetal and a Centrifugal force take part. The matter in the actual Globes of the sun, planets, moons gravitates or is pressed and packed centripetally into a spheroid form; but only as far as the centrifugal force also existing in those Globes allows. In those Globes, from the quantity of matter and its nearness to strong gravitating centres, the Centripetal force or Attraction preponderates, and the Centrifugal force acts at its feeblest, but with distinct powers, producing the variety in density or hardness between the matter of the sun-globe and planet-globes. For the mean Sun-matter is, bulk for bulk, lighter than the Earth-matter. And the Earth's-matter is softer or more liquid and gaseous than that of the moon.

A molecule of Atomies of Universe matter, called a Solar System, is shaped by Astronomical Gravity, balanced by the Centrifugal force, into an elliptical Orbit, or into a section or slice of a Spheroidal form; consequently in the Orbital shape of Universe matter there is distinct analogy to the Atomical shape of the Atomies themselves. To the starry and nebular systems, Gravity, always wedlocked and balanced to centrifugal force, gives a shape, also analogous to the prevailing shape of the Atomies of Universe matter. And in these Systems Mobility and Motion preponderate over the Compact Form of matter.

The Matter of the spheroid Earth-Globe and its Arrangements seem to me to have some analogy to the Matter of the Universe and its Arrangements. Earthly matter also occurs in Agglomerations of several sizes, which being comparable and compared with those of Universe matter, are in very small scale; so that the largest Agglomerations of Earth matter, with the largest interspaces, that correspond, as it were, to starry and nebular systems in the Universe spheroid, are alone visible to us; and are so far movable as to be disaggregated or separable by us. But when we reach Particles of Earth matter that correspond to the Atomies and Molecules in the Universe's Spheroid, or to the actual astral Globes and Solar Systems, then these Earth Particles and Molecules are necessarily so small and so near, that they are never visible or separable by us. Nevertheless, we assume that on Earth for Chemistry, as in the Universe for Astronomy, there exists analogous ultimate Atomies, and Molecules, and Spaces, or Pores filled with Ether that have analogies to those in Astronomy. For present in the Atomies, in the Molecules, and in their Interspaces in Earth-matter, we detect Gravity or a Centripetal force, and likewise types or analogues of the Centrifugal force, Motions of Expansions and Contractions in ethero molecular matter, polarly balancing each other, and producing light and heat, cold and shade, and the Quintessential Form and Colour Pulse in matter. The Atomy of Earth-matter, though so small as never to be visible, still being the Pith and Heart of matter, has itself a chemical Character, Mass weight, Photothermal Capacity, and Plasticity. And having Mass, the Atomy will gravitate to all centres of Gravity and to its own Centre, tending thereby to assume the spheroid form, analogously to what the astral Globes do. For Gravity depends on Mass and not on

Size; just as Life does not depend on Size, but quickens not only Colossal Trees and Animals, but also their Tinier Seeds and Ova; and also microbeal Particles so minute as to be barely visible by the best powers of the best Microscopes.

Tyndall's able and careful experiments on the Radiation of gases reduced to great Tenuity, and Grove's able Reasonings and Observations seem to me to force on Science some chemical Character for the ultimate Particles of Gases and of Matter. If so, in the Atomy of earth matter Gravity will act analogously to what gravity acts in the Atomy of Universe matter; and gravity will give to each tiny Atomy, as if it were a Sun-Globe, a special Centripetal self-attraction, that balanced by a special Centrifugal force will pack the Atomy's matter to the nearest centre of attraction; which is the Atomy's own centre. The chemical Gravity, the Centripetal and Centrifugal forces tending to shape the Atomy into a Spheroid; and sometimes so doing. But no Atomy exists independently, either on Earth or Universe; the Atomies occur in Systems or in Molecules or always surrounded by similar Atomies. And between them their mutual Gravity produces an agglomerative attraction, which balanced also by heat or centrifugal force, unites the atomies into a molecular system or shape, which is analogous to that of the Atomy itself. Farther, the Atomies and their molecular systems, being integrals of the Whole Earth, are subjected to the Gravity of Her centre or to the Cosmical Gravity.

For chemical Theory, therefore, there exists Three Gravities, balanced by Plus Heat —

1. The Gravity towards the Atomy's own centre; the Atomical Gravity.

2. The intratomical Gravity that binds up certain

numbers of atomies into *Molecules* and clusters, or systems of Earth-matter.

3. The Cosmical Gravity that packs the Atomies and their molecular systems, towards the Earth's own Centre; or that shapes the Atomies and Molecules in more direct reference to the Earth's own Centre.

The power of Gravity is directly as the amount of matter gravitating; and as the Globe of the Earth has for Chemistry the most matter and is unchanging, the Earth's or the Cosmical Gravity is paramount and fixed; so that no matter loses by chemical Action, either the cosmical or common weight or some Quintessential Form; but the power of Gravity is also inversely as the squares of the distances of gravitators. Consequently the power of Gravity increases most enormously with the nearness of matter to gravitating centres; and the matter of an Atomy being very near its own centre, gravitates thereto with great force; so that matter is not easily *dissipated.* Hence the great Strongholds of Gravity and of the Quintessential Form, exist in the Centre of the Atomies of earth-matter, and in the Centre of the Earth herself; and the Cohesion of the Quintessential Form swings or oscillates between these Two Stronghold Centres, at the expense chiefly of the Intratomical gravity, which is the weakest gravity of the Three gravities. For the Atomical, and specially the Intratomical gravities, from the smallness of the quantity of matter gravitating, are the weakest of the three gravities; and thus vary most by chemical Actions. The attractions and distances to Local gravitating centres, or the Local bulk of matter, or its Specific Gravity, are constantly being changed by Chemicalization. But what is called matter's weight, or its attraction to the Earth's Centre, or to the Cosmical Centre, is never destroyed, or lessened, or increased, by chemical Action; for the Cosmical weight is given by the Whole Earth-Globe, which All our powers in their utmost, cannot very perceivably modify.

The earthly Ethero atomies in molecules have a character, and have the form and colour pulse, being subjected to very rapid Waves of Plus sidereal shine power, oscillating with as rapid earthly Waves of Minus earthly or planetary shine power. The Ethero atomies in molecules are, therefore, expanding and contracting, or rapidly pulsating, like little hearts or musical strings, between those Cosmical Pulses of Sidereal and Planetary Shine power. When in preponderating planetary shine power, or Cosmical minus Heat or Cold, the matter in an Atomy shrinks and gets nearer to its gravitating centre, and tends to contract in size and pulse, more and more. But in Atomies, though ever so shrunken, the mass keeps the same, consequently shrunken Ethero atomies attract each other, as much as ever, and will thereby approach each other and will occupy less room; and the Local Attractions, therefore, then act with their utmost power. And if we have shrunken Ethero atomies, we have also shrunken pores and molecules, or the solid clusters of them, or of matter; in other words, the shrunken Ethero atomies cohere so around local centres of Gravity that they can be moved *en masse*, or as a cluster-whole, or as solids. The Local form of such cooled contracted Atomies in clusters, preponderates over their Cosmical form.

But if Plus heat or the Sidereal shine power act more preponderatingly on Ethero atomies in molecular clusters, it dilates them, or moves them Centrifugally, or farther from Local Centres of gravities, until the *Centrifugal* movements equal the Centripetal in an atomy; which will then pulsate as a spheroid; and will be in molecule cluster, surrounded by brother atomies, also as spheroids; among which the Centripetal and Centrifugal Motions are equally balanced to themselves and to the Cosmical gravity; so that all the Spheroidal atomies in molecule clusters can oscillate, either to Local or to Cosmical Centres of gravity; in other words, enjoy the freer, rolling movements on each other, and over the Earth, characteristic of Liquidity. And when in small amount those atomies in molecules can obey the Local Cohesion, and can take the Local Spheroid shape of a Drop. And when in large quantities can flow over the Earth, unifying themselves intimately with her Cosmical Shape, as her Oceans and Lakes, etc. But if Plus heat or the Sidereal shine power continue to act preponderatingly upon the liquid atomies and molecules, it will move both Centrifugally, farther and farther from Local Centres of gravities, until all the Local gravities be weakened; and until the Weakest, or the Intratomical, gives most way. The Ethero atomies, themselves dilated and rarefied, separate the most widely from each other, and pulsate in the shortest and quickest motions of the form pulse on earth. In other words, the atomies and molecules become Gaseous, and retain most of the Cosmical shape, less of the Atomical shape, and least of the Intratomical shape, or Cohesion; and, if in quantity, will flow over the Earth, and unify themselves with her Cosmical shape; and may become an Atmospheric Ocean around Her.

It is evident, therefore, that I give to the ultimate Ethero particles of Earth-matter not only relative motion or vibration, as is done at present, but both relative and actual Self-motion, or a Heart-like or a Music-like Pulsation; for if Matter has shine-tuning or a chemical Character, it is presumable that that matter will not lose character altogether, even in matter's ultimates. And such, indeed, seems to me the conclusion of Tyndall from the Radiation of rarefied Matter, after the most painstaking Experiments.

CHAPTER IX.

IDENTITY OF NATURAL AND ARTIFICIAL FORCE.

THAT there is a Chemistry for Nature is as certain as that there is a Chemistry for Art; nor do the Two Sister Chemistries essentially differ from each other. And if the Chemistry of Art cannot do without Fire, neither can the Chemistry of Nature. Just as the Fire of the Laboratory furnace is a necessity for Man's transient, local Chemistry, so is the Fire of the Dayshine and the Nightshine as essential a requisite for Nature's eternal, vaster, Cosmical Chemistry. And while the chemist's Furnace Fire is a flickering Spark, limited in Time, in Space, in Action, Nature's August Fires are Stupendous, Unquenched, and All-pervading. And Nature places all chemicals of the peripheral Earth in the Dayshine and Nightshine Fires.

And the chemicals then and there behave Photothermally as Specimens of them behave in Man's furnace fire. The elements take from Dayshine and Nightshine a Cosmical heat, and make it latent or localized in them as the Plus expansion in their Forms, and according to their thermal Capacities, checked by the other attributes of chemical Character, and by their neighbours. The elements will fuse, boil, or dilate with the Dayshine and Nightshine heat, analogously as they do with Local heat, and according to their thermal Plasticities, backed by the other attributes of chemical Character, and by their neighbours. The elements will radiate from the Dayshine and Nightshine heat, for they are known to do so by Artificial heat; just as there is an expanded, Fire-got form for chemicals in fire heat, so is the expanded form also possible to elements from the Dayshine and Nightshine heat; because the Capacity, Plasticity, Radiation of the Chemical Character exist in matter for the greater, universal, regular, perennial, Plus Cosmical Fires of the Dayshine and Nightshine, as they exist for the miniature, local, temporary, irregular but analogous Fiery Morphigenic Energies wielded by the Chemist.

But no earthly Chemical exists isolatedly. All chemicals are a small integral part of a much larger Whole—are only parts of the great Earth-Globe itself; and the Heats and the Gravities, or the Morphigenic Thermal Forces of every chemical, are connected with a great Whole, the mean chemical Earth-Globe, through the chemical Character present in All; and the Morphigenic Thermal Force, therefore, of every chemical is influenced not only by the Sidereal or Plus heat of the Dayshine and Nightshine, but also by the Planetary or Minus heat, or the Cold, also present in the Dayshine and Nightshine, from the earth-matter; and also by the Gravity of the Mean earth, or, shortly, by the Mean Terrestrial Morphigenic Cold forces of the Shapecraft. This Mean is representable mechanically by the mean density of the Earth, which is about 5½; and this Density has considerable Centripetal packing Power over all earth-matter. This Mean is further representable Thermally by considerable Cosmical planetary Cold; and thus becomes a great Cooling, Contracting Power and Agent over earth-matter. This Mean is further representable Morphically by a heavyish, hardish, little fusible Solidity, and possesses thereby considerable Morphigenic, Solidifying Power and Agency over Earth-matter.

It is by equilibrizing, through chemical Character, with this Mean of Terrestrial Morphigenic Cold Forces—in other words, with the Earth's mean gravity, mean minus, planetary, heat and light, or virtual cold and shade, mean Quintessential Form—that the Elements derive the contracting, cooling solidifying Forces in their own Quintessential Forms, or the Negative Forces, in the balance of their own Morphigenic Thermal Forces. But the Elements take and keep this planetary, minus heat and light, this earthly Cosmical cold and shade, this Plus gravity, this form contraction, this solidity or approaches thereto, each element in very different degrees, because each element has its own chemical Character; each has in different degrees the attributes for taking and keeping the Negative, the Planetary, the Cooling, the Contracting Forces, or the special Earth Forces.

The Quintessential Form in chemicals, therefore, is correlated to a Local Morphigenic Thermal Force in chemicals themselves; and this Local force is itself the Outcome of an analogous force in the surroundings of the chemicals, or in the Universe, or in the earth's sidereal and planetary and gravitating Shapecraft. A Sidereal, Positive, Expanding, Gasifying, Centrifugal, Plus heating, Vivifying, Impregnating Force or Motion, coerced and balanced, in very rapid Oscillations, in Ether and the Ethero-molecular Particles of matter—by a Planetary, Negative, Contracting, Solidifying, Centripetal, Cooling, Mortifying Force or Motion — evolves, according to equality or the preponderance of either Sets of forces, or by the varied chemical Character of matter—Cosmical Solidity and all its Pitches, Cosmical Liquidity and all its Pitches, Cosmical Gaseity and all its Pitches—evolves the Homologous, Scale-like Series of the Whole Quintessential Forms of the Earth; beginning, in the ascending Scale, from a dense or hard, badly-fusible Solidity, and rising to all its Pitches, and reaching Liquidity, and passing through all its Pitches into Gaseity in all its Pitches, up to the most rarefied Quintessential Form on Earth, the Hydrogenous Gaseity; or if in descending Scale, beginning at the highest Gaseity, the Quintessential Form sinks through the Pitches of Gaseity to those of Liquidity and Solidity, ending in the extreme Solid Form, the persolidity of the Carbon Type of form.

For chemical Theory, therefore, there exists the Quintessential Form and its producing Force, the Morphigenic Thermal Force of the Earth, consisting of the Gravities to which matter is subjected, and of the Two chief Shine Forces to which matter on earth is also subjected. There exists the Shaped matter or the Form and the Shaping Force. This force is a Double, Polar force, and the form is reciprocatively a Double, Polar form; for the form fits the force, and the force fits the form; for in its ultimates the Dayshine and Nightshine force is Sidereal and Planetary. Hence its inevitable Doubleness, hence its Plus and Minus, its Heat and Cold character, hence its Expanding and Contracting polarity, hence the force's Oscillating, or Give and Take, Coming and Going, Incident and Reflective, Advance and Recoil type. In ultimates, also, the Quintessential Form is always in Doubles. There is no Gaseity or Expansion which is not balanced by some Solidity or Contraction; there is no Solidity or Contraction which is not balanced by some Expansion or Gaseity. On Earth there is no matter expanded or gasified to its utmost, nor contracted or solidified to its utmost.

The Force Doubleness, the Cold never to be sundered from its Polar Heat, and *vice versâ*, is better observed and acknowledged in the Cold and Heat which are in that Cosmical Phase in which they are called the Minus and Plus electricities. In their more perfect Cosmicality, or as the Electricities, Heat and Cold are observable, independently of Prescriptions or of our Prejudices and Feelings, or by Scientific Apparatus. But when we are in a Local cold our feelings of it so preoccupy us, that we think only of the cold, or forget the heat which is always tempering the cold, according to the cold's degree; and when we are in a Local heat, the same happens; and we overlook the tempering cold in the Local heat. And while noting a Solid Form we ignore its Double, or the Expansion, or the virtual Gaseity which lurks in the Solid, according to its fusibility or volatility. And while observing a gas we are also apt to pass over its double, or the contraction or virtual solidity that lurks in the gas, according to the gas's liquefiability or solidifiability.

The Quintessential Form in matter, therefore, may be roughly likened to the motions of the needle in the galvanoscope of a thermopile. Present heat to the pile and the needle moves one way, through all the degrees of its scale, up to its stop; present cold to the pile the needle moves contrariwise, through all the opposite degrees, up to the opposite stop; and by a fitting Graduation of polar heat and cold, you can hold the needle or the form balanced and fixed, in all the degrees, Between the two opposite stops and forms.

CHAPTER X.

THE DAYSHINE AND NIGHTSHINE.

I LABOUR to present, *to myself at least*, and however imperfectly, a Chemistry in Nature, and for the peripheral Earth-matter, a Chemistry, therefore, not of Fits and Starts and Piecemeals, like the artificial laboratory Chemistries, but a Chemistry Eternal and in Cosmicality. In this Chemistry I study a most Common Thing, the Fire that Science has least regarded, namely, the Dayshine and Nightshine. And I am bound to study these fires because they Cosmically supply the Photothermal Motions to the Earth-matter, and therefore chemicalize the World.

The Dayshine is positively derived from the Sunbeams or Sunshine power. The Nightshines for Chemistry are positively derived from the beams or shine powers of the Star suns. Even by coming at nightfall after the locally very warm dayshine, the Nightshine may appear to solitary men, by contrast, less heating, or colder than reality. Howbeit, according to Pouillet, the Nightshine, because its Stars never set, and are in Vast Numbers, has advantages over the dayshine that make the Nightshine, cold though it seem, almost the equal in photothermal effects on the general Earth to the actual Dayshine itself.

I study, however, chiefly the Dayshine, all the more because what is studied and acquired in Dayshine avails with self-evident modifications also for the Nightshines.

Although the Sunbeams or Sunshine Power be the positive cause of all day light and day heat, or of all the Dayshine, still that Dayshine is very far indeed from being solely, purely, direct Sunbeams or Sunshine Power. We perceive little of the direct Sunshine Power or Sunbeams, for they are often clouded, and when unclouded, we seldom face the Sun in his Splendour, nor in our Homes or Doings. Moreover, the little of the direct Sunbeams or Sunshine Powers we may perceive by facing the Sun are not pure Sunbeams, for they all have passed through at least Forty Miles of Atmospheric Air. In the Dayshine we perceive, therefore, there is actually very little direct Sunbeams, and still less of Pure sunbeams. But besides the Direct sunbeams, we have the Regular and the Irregularly reflected sunbeams in the Dayshine; and it is these two last Sunbeams mingled together that are confessedly the most abounding Constituents of Dayshine. And so little direct and pure sunbeams exist in Dayshine that they may even be disregarded. And by far the most of the white hot Dayshine around us will then consist of Sunshine Powers that are issuing modified, or Irregularly Reflected, from Earth-matter; and thereby converted proximatedly into a *Material* shine; and also of Sunbeams that are reflected Regularly from the Earth-matter's surface.

When the sun beams upon the Earth Globe, we have not a single but a DOUBLE current of shine powers, namely, the *Coming* or the Sun or the Sidereal shine power current, and the *Going* or the Earth or the Planetary shine power current. These Two currents are always present *together*, but are not to Man equally Obtrusively present. The Coming shine power current from the Sun we readily perceive and admit, and is, indeed, generally the Only One that man takes into account. The Going shine power current leaving the Earth is not so Obtrusive; and Man, therefore, concerns himself therewith but little. But that this Going, Spaceward, Earthly, Planetary, Shine Power current has really shine Power, is known in Heaven, where This current is the Obtrusive One; for the Earth shines in Heaven as a Star-like Planet. It is therefore necessary to acknowledge and to remember that in Dayshine there exists TWO shine power Currents, the Coming and the Going currents, which meet and oscillate in very rapid circuits, thus developing much *Material* shines for the day. For between the Coming and the Going shine power currents the Earth's Peripheral matter is caught, embedded and involved, and specially that Gaseous Earth-matter which forms the Air Ocean around us and above us, namely, Nitrogen, Oxygen, Carbonic acid, and Water vapour, in the Skies. This vast Air Ocean, caught and embedded and involved between the Coming and the Going shine power currents, is molecularly bandied or alternately impelled by the Earthward Current in one direction, and by the Heavenward Recoil current in the opposite, and with the greatest of speeds. And all the Ether and Ethero-matter in the vast Air Ocean around and above us in the Skies must therefore molecularly oscillate between these advance and recoil or alternating opposite current Impulses, and with the same speed; and as the Atomies of the Air Ocean are struck to and fro, as Ether and Ethero-matter, by the alternating opposite current Impulses from the Sun and Earth, there is developed in Ether and in the Ethero Atomies of the Air Ocean, those rapid fits of easy transmission or of advance from the Sun, alternating rapidly with those fits of easy reflexion or recoil from the Earth, there is developed those Pulses which we perceive as the Air-Ocean's shine or Cosmical white light or heat, *and also form.* In other words, the Air Ocean is shaped and dyed and shiny, by oscillating rapidly, as Ether and Ethero-molecular matter, between the Coming Sunshine Power and the Going Earthshine Power. And the Dayshine and Nightshine, the day's light and heat, the Night's light and heat, are clearly the most important Shines or Heats and Lights we know; and are, indeed, the Types of all other Heats and Lights; and consist, in our ideas and for our Theory, of very rapid to and fro, or oscillating, or advance and recoil motions in Ether and in Ethero-molecular matter, which is Solo-ethereal, or Sun-heated, or Plus at one end or at the Sun pole, and Terro-ethereal, or Earth-cooled, or Minus at the other end or at the Earth pole, and Ethereal in the interplanatory and pore Spaces between. In these Oscillations or Shines the advance, the expanding, the positive, the earthward push or impulse comes from the Sunshine Power, from the Sun pole, the Solo-ethereal, Plus-heated, Plus-moving matter of the Sun; and the alternating Recoil, the contracting, negative, sunward push or impulse comes from the Earth shine Power, from the Earth pole, the Terro-ethereal, Cooled, Minus-moving matter of the Earth; and the propagation or intercommunications of the heated and cooled, the sun and earth Pulses or Pushes, the oscillatory Expansions and Contractions, the Advance and Recoil, flow along the all-penetrating and all-permeating Ether, involving the Air Ocean with the well-known speed.

And this is true on Earth, not only for the Day's light and heat or for the Dayshine, but also for the Artshines or Artificial light and heat, usually called Fire or Flame, etc.

For whenever any Matter on Earth has the Plus or Positive or Metalloidal character, there passes through that matter, and is there (as it were) stored from the cosmical Shapecraft's day and night shine powers, Plus, cosmical heatedness, or Plus pulsation, and the cognate, Plus, or Positive, or Gaseous, or Gasifiable, Light form of matter; and that Positive matter becomes a small, temporary Analogue, or even a humble Substitute of the actual Sunshine Power or of Sun matter. And whenever any Earth-matter has the Minus, the Negative, the Metallic, the Carbonoid character there passes through that Matter, and is there (as it were) stored from the cosmical Shapecraft's day and night shine powers and earth pressures, the Minus heatedness, the cosmical, Planetary cooledness, the Slowing pulses, and the cognate Minus or Negative, Solid or easily Solidifiable, Heavier form of matter; and that Negative matter becomes a small, temporary Analogue, and even a humble Substitute of the actual Mean Earth herself, or of her representative, typical and Planetary matter and shine power.

And if you place the cosmically heated or plus pulsating sunshine-empowered matter—say, gaseous Oxygen—in molecular contact with the suitable cosmically cooled or minus pulsating earthshine-empowered matter—say, persolid Carbon—then we have in Analogue, and face to face, a Microscopic Sun and Earth, with their respective shine powers; and there is then a possibility of developing between the tiny Sun and tiny Earth, or between Oxygen and Carbon and Ether, to and fro motions, impulse and recoil motions, heat and cold discharges, oscillating form expansions and contractions, similar to those that in grander scale, and to better purpose, pass in interplanetary and poral Ether constantly between the actual Sun matter and the Peripheral matter of the earth, involving Ether and Ethero-molecular air matter; and thereby giving us the actual Dayshine, or our daily light and heat, and the accompanying matter Transformations on the face of the Globe. We can thus produce between these two opposite Kinds of purely Earth-matter, and in many cases besides that of Oxygen and Carbon, and without the *Personal* Presence of the Sun, a small, passing but locally intensified Imitation of the day's matter transformations, and of the day's accompanying heat and light, or of that Dayshine which is usually called sunshine; a copy of Dayshine usually called fire, flame, combustion, etc., etc. I would fain hope, therefore, that there is complete analogies between the Fires on Earth and the greater Fires from Heaven. I submit that the Suns and Planets burn each other as their Analogues on Earth—Oxygen and Carbon—burn each other; that is, by mutual oscillations in Ether and in form and force. But Nature's or the Solar and Planetary Conflagrations are for higher aims and things, and, indeed, give the heat and light, the transformations, the life and loveliness of universal creation; while Man's fortunately tiny Burnings have other objects, and are oftenest destructive of the lovelier Woodwork Forms of Nature. The Forces and Forms that give us the Firesparks of Earth, give also the august splendours of the great Fires of the Universe; as the Forces that give the Earthward Applefall on the Earth-globe, also give the Earthward Moonfall from Heaven, or give also the Gravities of the Whole Universe.

The best and most light and heat, the best and most matter transformations, are the natural Ones, and occur during Dayshine, or during the mutual Combustions and Actions of the actual Sun and actual Earth; that is, in the personal presence of the vast, real Sun shine power and real Sun matter; and in the presence not of small typical bits of Earth, but of the Whole Earth-globe with its earth shine and form Powers. Howbeit, we also happily obtain heat, light, and transformation from terro-solar bits of Earth-matter, and in the personal absence of the sun; a light, a heat, a transformation with humble but complete analogies to those that Hail the Sunrise on Earth. For two Atomies of the matter of the Earth, one Atomy called Carbon, the other Atomy called Oxygen; representing Carbon, the Earth and its shine and form power, and Oxygen the Sun and its shine and form power, will give us Fire on Earth and Transformations; and constant Fires and forms too; since Carbon and Oxygen abound on Earth; and while one Oxygen and one Carbon are burning and transforming, other equivalents of burnt Carbon and burnt Oxygen are unburning, untransforming with plants in Dayshine, and thus making themselves ready to burn and transform again. Two Atomies of the matter of the Universe, a Sun and an Earth, representing oxygen and carbon, give us the Day-fire and Transformations, which are constant and everlasting, since Suns and Earths or Planets abound in the Universe, and while One Sun and One Earth are burning, other Suns and Planets are unburnt in the Universe, and can supply the burnt with fresh burning Energies or Powers. In other words, Suns and Earths abound in the Universe, and are always burning and unburning and burning again, in Cycles, with the forces of the Universe and of each other; for the Universe itself is on fire, and is One.

We obtain a small, artificial Fire; that is, a tiny Dayshine; that is, Light, Heat, and Transformations, in a limited spot of matter, and of time, on earth, in the personal absence of the actual Sun himself, because the Earth herself, though tiny as a Dust-speck, claims kindred to the Universe; and in the Mass of matter of the Earth-Globe, as in the Mass of matter of the Universe, there exists two Kinds of forces, forms, matters, acting One on the Other—the Solar force, the Solar matter, and the Solar form—in Antithesis and Union with the Planet or earth force, the Planet or earth matter, the Planet or earth form. And Whenever and Wherever, be it in Earth or in the Universe, these two Forces, Forms, and Matters face each other, they act, they oscillate, they blend, they shine, they transform in Cycles or potentially for ever and ever. When these Forces, Matters, and Forms are small and weak, as they are in the already small and weak Earth-Globe, then the two must touch closely ere they act or oscillate. But when these Forces, Matters, and Forms are Sun-Globes and Planet-Globes, they are strong and act as the Atomies of a Universe, and are able to shine and transform at what seems to small and fleeting, physical Man, vast distances and long times; for the Whole Universe is One and Eternal; and might be viewed through Chemistry, as it has been viewed through Mechanics or Gravity; as it has been viewed through God or through Religion.

There exists on Earth, Matter which is positive, metalloidal, solar—that is, Matter tenacious of the expanding forces and forms of the Sun; Matter that acquires from the distant Sun, and retains stably, even during the nightly absence of the Sun, part of the Sun's expanding force and form. Such matters are on Earth as smouldering Embers of her Sun, or have the Positive or the Sun shine power. And, *à fortiore*, there exists also on Earth, and more abundantly, the negative, the metallic, the carbonoid, the earthy, the planetary Matter—Matter that acquires and retains, even in the presence of the distant Sun, part of the Earthly contracting force and form; Matter, however, still capable, with a molecularly *near* sun-matter, or virtual sun shine power, or in an intensified sun force—of shining or of expanding and oscillating in force and form. With this double Earth-matter, with such Positive and Negative, such Gasifying and Solidifying, such Heated and Cooled, such Solar and Planetary matters, forces, and forms, we produce, easily enough, the oscillatory exchanges of Plus and Minus Morphigenic Thermal Forces that awake heat, light, and transformations; we can produce a small, short, but near and concentrated dayshine, very like, in a humble way, the so-called Sunshine itself. And neither in the Earth nor in the Universe do we ever perceive heat, light, and transformations produced except in the presence of analogous, Positive, and Negative forces and forms. The Universe teems with Suns and their Planets—teems with Sun shine powers and Planet shine powers; the peripheral Earth is full of analogous Double Matters and Forces. So long as you have Suns and Earths and Analogues, you can develop light, heat, and transformations, and not else. You may develop light, and heat, and transformations in the personal absence of the actual Sun, but never in his complete absence—never in the total absence of the Sun's earthly substitutes, the positives, generally metalloids, the chief of which, for *furnace* or Plus-heating work, is Oxygen. But neither can you have fire or a dayshine in the total absence of the Earth, or a substituting bit of her, the carbonoids and metals, or the negatives, or of a planet; for the Essentials of fire, or of heat and light, are oscillatory Ethereal, and Ethero molecular motions of advance and recoil; and if there be no earth, no planet, or analogues, there can be no recoils against the advances, there can be no light and heat, etc. We accordingly fail to pass an Electric Spark through matterless spots, or in our best Vacuums.

There is, therefore, no such thing on Earth or Creation as a one-sided Sunshine. There is, properly speaking, no *Sun*shine at all; for the Sun only shines because the other Suns, the Planets, and the Earth, and all that her periphery contains, including Plants, Fauna, and, therefore, even Man, shine with the Sun, and not else. The Earthshine, even the Manshine, is an Item, is an Essential to the Sunshine; as the Sunshine itself is an essential to the Earthshine or to the Manshine. As long as man himself shines his brightest, or basks in the Dayshine and Nightshine light and heat, and breathes incessantly dayshine incandescent air, drinks dayshine moltened waters, eats dayshine cooked food from Plants and Animals, Man lives, or shines brighter than the Commonalities of Earth. But when Man ceases to do those Things *physical* man dies, or ceases to shine any better than Commonality, or returns to dustshine. For not only the Air, not only the Flora, the Fauna of the Earth, shine in the dayshine, but all the Peripheral Matters, even the dust of the earth, are bandied molecularly, to and fro, between the Sun and the Earth Pulses; and *All* shine, but with a lesser shine than air. For the shine pulse in matter is correlated to the form and colour pulse in matter; and that matter which transforms and colours best on Earth, namely, the matter of the air, which in ultimates is the Organic Elements, shines best also. For in air are contained Nitrogen, Oxygen, Carbonic acid and Water, or Carbon and Hydrogen; and in Air, therefore, are in Essentials contained those Organic Elements which shine pre-eminently in almost all the higher Forms and Colours of the Earth. And because these Four Elements are the best for being coloured and transformed or shaped by the Sun and Earth shine powers in Organic Chemistry, they are also the best at shining more directly in the Sky by the Same shine powers.

CHAPTER XI.

THE WORK OF THE DAYSHINE AND NIGHTSHINE.

The Air is our most inseparable Companion from Birth to Grave. We breathe always an Air that is the Commonest of Things. But Air is not thereby the less Unobtrusive or the less Wonderful. Man perceives air with difficulty; so much so that he easily ignores it: and unless air move, we have no native English name for air. And in motion we call air by the other name of breeze or wind. And because man knows little about this air he is somewhat superstitious over it, as a Child is in the Dark; and following his bent, man for a mysterious thing, procures the rather mysterious Greek name of Air, and is satisfied fully, only when he has made bad worse, or dark darker. But even Science is not altogether guiltless of lingering superstitions about this Air; for Science seems to take it for granted that gaseity is an inherent attribute or property of this air's matter. This Air, says the present Dogma, is gaseous by Birthright. Such is the dogma even after we see part of the air's gaseity, its water vapour, leaving air during the winter's cold with the solid, falling snowflakes; even after Science herself with her scientific little Winters or with her freezing mixtures' cold, has actually solidified all airs—viz., the Nitrogen air, Oxygen air, Carbonic acid air, Water air—and when solidity and not gaseity is the attribute of matter left to the planetary Earth-globe widowed from the Sun and Stars. But if the gaseity of all the airs, like all other gaseities, may be withdrawn from airs by cold and imparted to airs by heat, in endless swings, solidity as much as gaseity is the property *on the planet earth*, not only of Water air, but also of Carbonic acid air, of Oxygen air, and even of Nitrogen air, or of all the air ocean together; and gaseity is given to air, and most specially to the Nitrogen air and to the Oxygen air, by force that is, not only by heat, but by very great heat force indeed; since very great cold is needed to cool these airs of their heat.

This great air heat our Theory derives positively from the Sun and Stars, because besides them there is no other positive source of heat; and because the Sun and Stars are constant, befitting and capable sources of such a heat. And this great heat differs from man evolved or artificial heat, only by being Cosmical Heat, that is, by being a universal, regular, constant, perennial heat that can therefore be acquired and changed by matter or ourselves ONLY *through our chemical characters*, or, that is, the most *stable* of heats. In the air there is a special heat sensibility called a character, consisting of special Capacity, Radiation, Conduction, Plasticity, and Weight, that enables air to be par-boiled by a Cosmical Sun and Star Fire that only more mildly heats man; against which man is furred or protected by a character differing from that of air.

Cool this air a little, and its watery part, or the water air, solidifies, often into the falling snowflakes. Cool this air still more, cool it much, and each of its parts in turn

—its Carbonic acid air, its Oxygen air, its Nitrogen air—all solidify, each into its special solid snowflake, proving that air is not inherently gaseous. On the other hand, modify air's *character*, which you can do by *combination* or by *blending* air with other matter, and in that case also all air will solidify.

Place a hard Quicklime stone in air, and the Water air modifies the character of the Stone, and the Stone that of Water air. The water air combines with the stone, the stone with the air, and the quicklime stone is slaked; that is, the water air hardens or solidifies in the hard stone, and the hard stone softens and crumbles to powder in the soft water air. The characters of both the air and the stone are mutually changed in slaked lime, and both stone and air are mutually changed also, along with the changed or modified character. Place now your slaked lime powder in air; and the same will happen between the Slaked lime powder and the Carbonic acid air that happened between the Unslaked lime and Water air; but with more difficulty, that is, the Carbonic acid air, which is even more difficult to solidify than the Water air, takes in the slaked lime a marble solidity as the Carbonate of lime. Again, place Potassium in air, and the same will happen between Potassium and the Oxygen air as happened between unslaked and slaked limes, and water and carbonic acid airs; or the Oxygen solidifies in Potassium or becomes its part of caustic potashes. And the same thing happens to Nitrogen, but not so directly or obtrusively, for Nitrogen is the Element most difficult to solidify; howbeit even Nitrogen is often found solid; but only in the upper pitches of solidity or specially in Organisms.

I submit, therefore, that air's Gaseity on Earth is not a very fixed Birthright of matter, but is acquired positively by force or from the cosmical effect of the Sun and Star shine powers, through air's character; and air's gaseity is, therefore, lost or won, or modified, when either heat or character is modified, is lost, is won, in Air.

The Dayshine is, therefore, analogous to fireshine, and the fireshine to the Dayshine; but the Sun is not the All in All in this fire. The Sun, indeed, kindles this fire at morn, and feeds it through the day, with an Oxygen-like shine power; but the Sun even cannot burn Alone, or cannot so act without the Earth, just as Oxygen cannot burn alone, or give us fire or action by itself, without the Coal to burn; or the Coal is itself useless for burning without the Oxygen. Consequently it is those Elements on Earth that are the most active chemically, that can also best oscillate molecularly with the positive and negative Sun and Earth powers, and that produce, therefore, the actual Dayshine itself or the heat and light and transformations of day—a heat and light in which we move and have our Being; and which we, indeed, as Fauns actually help to produce and feed.

We safely judge of matter's aptitudes for the *unobtrusive molecular* motions of heat and light, between the Sun and Earth, by that matter's aptitudes at the *obtrusive molar* motions, between the Sun and Earth powers; and also by matter's aptitudes at formations and transformation, at colorations and decolorations, as in Organic Chemistry, between the Sun and Earth powers.

The whole Air Ocean oscillates *molarly,* or constantly rises and falls barometrically, upwards and downwards. The Water air falls *molarly* as rain or snow; and rises *molarly* as vapour and clouds; or oscillates *molarly* constantly, upwards and downwards, between the Earth and Sky. The Carbonic acid air rises *molarly* skywards from the Earth and the breath of Fauna, and falls *molarly* earthwards on to Flora, during dayshine; or oscillates *molarly* constantly upwards and downwards, between the Earth and Sky. The Oxygen air during dayshine rises *molarly*, from Flora skyward, and falls earthwards on breathing Fauna, constantly; or oscillates *molarly* between the Earth and Sky. And although the Nitrogen air does not much oscillate *molarly* between the Earth and Sky, still the sky Nitrogen forms the positive Basis or Centre for the oscillations on Earth; the Point on Earth from which the positive oscillations for ethero matters first depart; or Nitrogen acts Prometheus for the Sun's shine powers to the rest of Earth. These vast yet distinct *molar matter oscillations* on Earth go on eternally, while the Sun and Star shine powers flowing upon the Earth-globe meet the Earth's own shine powers in certain classes of Earth-matters. These Oscillations arise because the Sun and Stars impregnate certain peripheral Earth-matters with motions and with form, in the teeth of a recoil or resistance in those matters; and the Sidereal push and Earthly recoil develop these great *molar* matter Oscillations. And if this Push and Recoil can so bandy such vast masses of matter *molarly*, surely they can also move *molecular* matter with the speed of light and heat pulses—in other words, can give us the actual Dayshine or Nightshine, the light and heat, and transformations of the World.

The Sun's shine powers coming Earthwards are first received by the Earth's sky nitrogen air, the ethero atomies of which the Sun shine powers bandy positively into the quickest molecular oscillations on the natural

Earth; for the Nitrogen air is the lightest and most pergaseous of Earth's native matters. The oscillating power from the sun passes, therefore, first through Nitrogen air, and when issuing therefrom to proceed down or Earthwards the oscillating powers issue sifted and mulcted of their highest pitches, those, namely, that went and remained to bandy and to dye nitrogen into shape and colour. And all the earth-bound sun powers were at the pick and choice of the Nitrogen air, but Nitrogen took or chose only what its character could; or Nitrogen mulcted, sifted, and *rejected* as surfeits much pitch-lowered Sun powers, which, proceeding down, next passed to the Oxygen air, which the pitches thus lowered suit; for Oxygen air is itself of a lower pitch than Nitrogen; oxygen being the heavier and the more liquefiable gas. In the Oxygen air the Sun shine powers are treated and utilized as they are in the Nitrogen air; and from Oxygen issue mulcted, sifted, *rejected*, surfeited, pitch-lowered Sun powers, which, proceeding down, pass into the Carbonic acid air, which the lowered Sun powers suit; for Carbonic acid air is of a much lower pitch than Oxygen; carbonic acid being the heavier and more liquefiable gas. In Carbonic acid air the Sun powers are treated and utilized as they are in Oxygen and Nitrogen, and pass to the Water air in lowered, *rejected*, surfeited pitches, suitable, however, to Water air; for the Water air is of much lower pitch than Carbonic acid air, being far more easily solidified. From the Water air the sun shine powers pass, sifted, mulcted, surfeited, *rejected*, pitch-lowered, to the land Waters, to Flora, to Fauna, and finally to the soft, stratified dissolved layers of the peripheral earth; and throughout all these classes of matter the Sun shine powers are received, utilized, *rejected* analoshine pitches that the Nitrogen and Oxygen in the sky have mulcted from the compass of the Dayshine's force, or from the Spectral Force. But in mulcting, or in taking out of the Compass of the Dayshine fire or Spectral Force the Blue pitches of shine, the nitrogen and oxygen of the sky or the oxynitrous air sift the Dayshine; that is, not only take but also repell, or surfeit, or irradiate from them, the complementary pitches of Dayshine, consisting of the sensible vivid Red and Yellow of the corresponding Clef of Dayshine. Around the blue shining Oxygen and Nitrogen of the air ocean, or around the *Oxynitrous air*, there is emanating, surfeited, repelled, sensible Red and Yellow, or pitch-lowered Dayshine. Two dayshines, therefore, always accompany the oxynitrous air of the sky, air's own Violet Blue, fixed, localized, absorbed Dayshine, and likewise the sensible, free, Red, and Yellow Dayshine, the air-repelled, surfeited Dayshine, the Complement shines to the absorbed air shine.

But on the peripheral Earth-globe there exists not only the Oxygen and Nitrogen of the sky air, which we call the oxynitrous air, but also the sky Carbonic acid and Air waters, and the Land waters, besides Flora and Land, or the Earth's mineral, softer and harder solidities. And each of these has also its special photothermal or chemical character, which compels them to absorb or to mulct each its own special pitches of Dayshine. And, according to the pitches of Dayshine, each fixes, or absorbs, or localizes in itself, so will each be shaped and dyed; each also surfeiting or repelling the sensible Dayshines that are Complements to the shine each absorbs. And connected with the Cosmical Waters, with Flora and with the Lands, there are, as in oxynitrous air, always two Dayshines, namely, the absorbed and the repelled Dayshine's pitches. The sky Waters are gaseous in shape, and at Sunsets and Sunrises shine vividly Yellow and Red by the *transmitted* horizontal Dayshine. And the sky Waters, gaseous in the air, shine characteristically or best at morn or eve, or with a *horizontal* source of Dayshine, because horizontal Dayshine passes through or agitates much more of the sky Waters than the over-head Dayshines. The Aërial waters, shining by *transmitted* Daylight and heat, and then shining Yellow and Red, shine in their own true or absorbed Dayshine colours; and the Aërial waters must have, therefore, absorbed from the Dayshine, and then fixed the vivid Yellow and Red pitches, or refrangibilities of the Dayshine, and not the Blue, nor Violet, nor Ultra-violet. But the vivid Yellow Red pitches of Dayshine are those that all the Oxynitrous air and partly Carbonic acid air, in contact with the Waters of the Earth, are surfeiting and repelling in a sensible state. The Sky and Land waters, therefore, derive their dayshine pitches that they fix, their Red and Yellow dayshine, and therewith their Shapes and Dyes, from those dayshine pitches that the Oxynitrous air, and partly the Carbonic acid air, in touch with much of Terrestrial waters, sift and repel in a sensible state. The Waters and the Three stable Airs of Earth, the oxygen air, the nitrogen, and the carbonic acid air, are therefore Copartners in certain pitches of the Dayshine, namely, the Violet, the Blue, the Yellow and the Red Dayshine pitches; and these Pitches of Dayshine can amalgamate, can attract each other, so as to mingle into individual undistinguishableness, or into White light, which is like a perfect Chord of all the *colour* notes of Dayshine. But we argue that the native Form of air is borrowed from the native Dayshine and Nightshine, and the Form is therefore correlated to the Shine; so that bodies like Water, Carbonic acid, Oxygen, and Nitrogen, that can take Shines blendable into individual undistinguishableness, can take Forms likewise blendable into individual undistinguishableness, can take a Chord-like mutual union and blending. During Dayshine accordingly there is Carbonic acid air, Oxynitrous air, and Water air, made in the same Batch by Nature, all looking generally so like each other as to be practically undistinguishable. There is always Water taken up, and equally diffused, into the lower sky Carbonic acid and Oxynitrous airs; and Water is *there* so shaped and dyed and gaseous as to make a Chord or a blending with the other sky Airs so perfect, that Water is air like, while in its lower sky allotropy. And on the other hand, there is always, in the Waters on the surface of the Earth, the stabler sky Airs attracted, drawn down, dissolved, and so shaped and so dyed, as to be liquid, and shining so like the Waters themselves, as to be quite undistinguishable.

The two great Chemicals of Cosmical Chemistry, the Waters and the Stabler Airs of Earth, have, between and among them, undistinguishably blendable colour Shines, undistinguishably blendable Forms; and therewith a most powerful mutual attraction that makes them very fast Friends or molecular dance partners during the Dayshine and Nightshine of Earth. For by this attraction's Might during the Dayshine's and Nightshine's action, Tons of water are incessantly attracted and whirled or danced up, or, as is said, *evaporated* into the sky oxynitrous and carbonic acid airs. And Tons of oxynitrous and carbonic acid airs are likewise attracted and drawn down, or, as is said, dissolved by the Oceans and by the Waters of the surface of the Earth. For this Attraction is never one-sided; if the Waters attract the stabler Airs, the Airs, in their turn, attract the Waters.

But as these stupendous Air and Water Attractions are natural, or very, very Common, or a matter of course to us, from our Cradles, they strike us little, or are bewondered much less than the Attraction between a small bit of dry, rubbed Amber and a smaller bit of light Paper.

CHAPTER XII.

THE WORK OF THE DAYSHINE AND NIGHTSHINE.

THE first Task of the Dayshine and Nightshine furnace, therefore, is to melt and boil the solid earth-matter, called Nitrogen and Oxygen, into the gaseous oxynitrous air Ocean of the skies. And this is, indeed, no slight Task. For in the Earth's stabler air Ocean we have Billions of tons of the solids Nitrogen and Oxygen expanded into a Steam of more than a Thousand atmospheres' high pressure Power. In the Violet blue air Ocean in the sky, there is localized an enormous amount of the Dayshine's and Nightshine's Photothermality, or an Enormous pulsatile Ethereal and ethero-material Force. Moreover, in the pergaseous stabler air Ocean, there is not only a vast amount of the Ultra-violet, the Violet and Upper blue heat pitches absorbed, localized or latent, but from this air Ocean is also repelled, as sifted surfeits, Yellow Red heat pitches, or Pitch lowered heats; and this air Ocean is therefore not only very cosmically heated *itself*, but also a strong potential Heater of *others*. For at the expense of the Photothermalities of the stabler air Ocean, the Waters of the Earth are melted and boiled, and the Flame of the breathing and unbreathing Lives of Earth is kindled, and burns in Cycles, or potentially for ever. And in like manner, in the molten Blue Waters of the Earth there is not only a vast amount of the Yellow Red Pitch of heat absorbed, localized or latent, but from the Waters is also emanating, repelled, sifted surfeits of the darker pitches of Cosmical heat; and the Waters, therefore, are not only cosmically heated *themselves*, but also a strong potential heater of *others*. For greatly at the expense of the photothermalities of the Oceans of waters, the solider parts of Earth are partly dissolved, are heated, and softened, and stratified. And it seems to me probable, or at least possible, that even the Volcanic fires or the so-called Central Fires of the Earth, may be ultimately Guises or Disguises of the dayshine and nightshine.

We recapitulate.

The Oxynitrous air of the sky sifts the Dayshine and Nightshine by absorbing, roughly speaking, the Ultraviolet, the Violet, and the upper Blue pitches of their Photothermalities or Spectral Forces; surfeiting and repelling the lower Blue, the Yellow, the Red, and Ultra-red forcepitches. And these Oxynitrous air-surfeits, the sky Carbonic acid air receives, and sifts by absorbing the lower Blues and upper Yellow forcepitches; surfeiting and repelling the lower Yellow, the Red, and the Ultra-red pitches. And the Carbonic acid air-surfeits, the sky Water air receives, and sifts by absorbing the Yellow, Red, and upper Ultra-red pitches, surfeiting chiefly the lower and lowest Ultra-red pitches; which the soluble and softer and upperlying Layers of the solidities of the Earth receive and absorb; and these solidities are seldom bright coloured, but rather dim as well as solid.

Between space and the sky Oxynitrous air, and between That and the Carbonic acid air, and between

That and the Water air, and between That and Water liquid, and between That and the Lands, and *vice versâ*, there is a closed Circuit of linked sensible shine powers, a closed Current of Plus and Minus force, of Sidereal and Planetary shine powers, of Plus and Minus Cosmical heat and light, which I have always called the Dayshine and Nightshine, but which is at present called Sunshine and Starshine.

In the direction from Space to the stable sky Airs; and from Them to all the Waters, and from Those to the Earth's peripheral Crust, these shine powers are Plus, Sidereal, Advance, Expanding shine powers; but in the opposite direction from the Earth's Crust to all the Waters from Them to stable Airs, and from Those to Space or the Universe, the shine powers are Minus, Planetary, Recoil, contracting shine powers.

And these currents of two shine powers, consisting of a Plus sidereal and a Minus planetary Current, are opposite and meeting currents, and thereby produce in Ether and Ethero molecular matter a constantly oscillatory force current, between the Plus, Sun, and Stars, and Minus Earth. A Current which is the Giant counterpart of a Galvanic force current, between the Plus and Minus poles of a Voltaic Battery. But the Dayshine and Nightshine currents are in so Grand a Scale, are in circumstances so different from artificial Laboratory galvanic or electric currents, that the Dayshine and Nightshine currents seem not yet to be even suspected of Electricity. But even the lips of Science call them by the name of Sunshine and Starshine.

Moreover, you might view these two shine power currents, as Material or Form-making currents, for the Earth; the day and night shines being correlated to matter

Cosmical or native Quintessential Forms, to matter's own *natural* form and colour Pulse. In that case, the Dayshine's and Nightshine's oscillating powers, agitating the Oxynitrous air Ocean, expands and gasifies and violet-blue dyes that vast mass of matter; and then the gasified Air, by the heat that blazes or surfeits from it, expands and gasifies the Carbonic acid air; and gasifies and orange dyes the Water air; and expands and liquefies the Waters in touch with Land; and then these Land waters, in their turn, by the heat surfeits that blazes from them, expand and liquefy the Lands by dissolving or virtually liquefying part of them, and by sinking and soaking into them, and disintegrating and stratifying them. Hence considerable portions of the Earth's Solids are diffused and dissolved through her Waters and *vice versâ;* and considerable portions of the Earth's Waters are diffused and dissolved through her Airs, and *vice versâ*. The Oceans are Briny with the solidities of Earth, the Solidities of Earth are dissolved or soaking moist with the Waters or the chief Liquid of Earth. The Stable Airs are ever damp with Waters, the Waters are ever äerated with the Stable Airs. Nothing in these Phenomena is ever isolated or one-sided, except Man's Judgment of them.

The Earth's shine power and gravity never cease to struggle or to recoil against the Sun's shinepower, during all its Earthward course. And at the deep primary Rocks the Earth's shine powers act best on Form, and then persolidify the Earth's Form; and thence, as from a Barrier, the Earth powers advance and continue to contract earth-matter in their spaceward course, as long as there is earth-matter to contract, or up to the outermost Rim of the Earth-globe, or to the Surface of the Earth-globe's encasing air Ocean. Nor does the Earth's contraction stop there, but continues in the interplanetary Ether until it reaches the actual Sun-matter; and is thence driven back earthwards by the expanding recoil of the Sun-matter. In other words, the Planetary shine power Current, beginning in the unstratified, deepest Rocks solidifies them; thence passing, it partially solidifies the softer stratifiable Rocks; thence passing, it partially solidifies the Land waters by brining or icifying them; thence passing, it partially solidifies or condenses the sky Air by damping it; then it passes to Carbonic acid air, to the Oxygen and Nitrogen airs, densifying each in its turn; and thence passing, it densifies interplanetary Ether until it reaches the matter of the Sun which it densifies; meeting there, however, with the earthward recoil Impulse, therewith to recommence the Cycles of the oscillatory terro-solar Processes, by which arise the Heat, the Light, and Matter Transformations of the Dayshine and Nightshine.

CHAPTER XIII.

WORK OF THE DAYSHINE.

We submit, therefore, that there is a linked discharge of the Dayshine and Nightshine force in a Scale-like chain of pitches and forms, constantly passing from Space to the Earth's surface, and from the Earth's surface to Space, to and fro, through Air, Water, Flora, Land, or through the four great Classes of the passive matter on Earth. And in matter we note an attraction, or fitness, and a repulsion, or unfitness, for shine—a shine character—and in the Dayshine force itself an attraction and fitness and a repulsion, or unfitness, for matter, that we have taken advantage of in conceiving the Phenomena of Chemistry and its Belongings. These linked dayshine and nightshine Discharges of ethero-molecular matter pulsations, coming from solar and starry space, Earthwards, and going from planetary Earth, Spacewards and Sun and Starwards, and meeting and progressing in oscillations with each other—are derived from the sun and the stars on the one hand, and from the earth's shine powers and the earth's gravities on the other. Consequently these linked discharges Never and Nowhere fail, even at the Dead of night. And for that Half of the Earth Globe that is Sunless during night, or for the benighted Hemisphere of the Earth, or for large tracts of Earth—

the Stars' light and heat—the nightshines—according to Pouillet—*nearly equal the Sun's light and heat*, or the Dayshine; and the Sun's nightly absence in nightshine, is greatly compensated there, by the Stars' nightly presence. So that in Spots of the benighted Earth the linked discharges of shine force are not extinguished, at Nightfall, but are lessened into the smallest pulse amplitude, and reach, indeed, so narrow amplitudes, that Night reduces the Vitalities of Earth also to their smallest amplitudes of vibrations, or to a Sleep or Night-life; or to what resembles Death, or to what threatens the Life-flame of the benighted Earth with the extinction of its pulses and heart-beats.

These force discharges throughout their linked Circuit in earth-matter, in Day and Night, never cease to be the same in principle, never cease to be intrinsically Shine Force, Heat and Light of lower and lowest, or higher and highest, and middle pitches. Howbeit, these Discharges are seldom traced by us in their link individuality, during their normal course; but collectively they are superficially considered to be the white *sun*shine or *star*shine. Nevertheless, passing Irregularities now and then occur on Earth, in the distribution and course of the Links of these Dayshine and Nightshine discharges, known in their Aggregate by the name of sunshine and starshine; and then we perceive how Magnificent and how Powerful are the Dayshine and Nightshine Forces that are linked or enchained, and constantly coursing, to and fro, night and day, oscillating everywhere, through, and among the peripheral earth-matter. These Dayshine and Nightshine link disturbances are called Thunder and Lightning, and Volcanic (?) Storms; but They are more Common and more Useful to us, as our Fires, our Lights, our Electricities, and our Chemistries.

CHAPTER XIV.

LIGHTNING A GUISE OR DISGUISE OF DAYSHINE.

IN Midsummer, there is the Maximum of Dayshine and Nightshine flooding a landscape of Earth; and there is then made by the abounding Dayshine passing, to and fro, through the stabler air Ocean of the Landscape, a Maximum of the air-surfeited and repelled Dayshine. The Waters on Land and Flora attract and absorb those surfeited Dayshines; and the Waters are thereby attracted and evaporated, whirled or danced up, from Land and Flora into the air Ocean of the sky, as water-cloud vapour; and form thick masses of the Thunder clouds, in the still or sultry midsummer Sky. In the Sky of the Thundery Landscape, there is within the thunder cloud, the air-surfeited dayshines that water absorbed to become thunder Cloud; and from the thunder Cloud is issuing cloud-surfeited dayshines; and both dayshines—that within and that without the Cloud—are in excess or plus in air, by its Thickly Clouded State. The Waters or the Liquid form, and the liquid-making or expanding pitches of dayshine, by rising from the Earth's surface and Flora, left behind there a parched Dryness—that is, left behind on the Land and Flora of the thundery landscape, the solid-making or the contracting or Negative pitches of dayshine, in excess.

There arises, therefore, a Disequilibrium in the thundery landscape, between the pitches of the dayshine and the forms of the earth's surface and of flora, and those of the skies. On the Surface of the earth and flora there is parched dryness or want of liquidity, there is over solidity, or too much of the contracting pitches of the dayshine, there is force and form Negativeness : on the other hand, in the thundery skies, there is dense cloud moisture, or plus gaseity, too much of the expanding pitches of dayshine; there is force and form Positiveness. In a thundery landscape there is a Plus force and form superabounding in the Sky, which the Land, the Land Waters, and the Flora lack, attract, and can appropriate, eagerly and greedily; and there is a Minus force and form superabounding in the thundery landscape's Lands, Land Waters, and Flora which the Sky Waters lack, attract, and appropriate. When this Plus and Minus dayshine and form Disequilibrium between the Earth and Sky, in a thundery landscape, reaches a certain pitch, which it does readily, if the stabler sky Airs keep thundery or still and sultry, then the Water and Dayshine storm, the Thunderstorm breaks; and the shine and form Equilibrium ensues. The Dayshine of the superabounding gaseous Cloud waters in the thundery sky suddenly leave them, and with the dayshines, the sky waters' Cloud form suddenly leaves them also. The dayshines are seen leaving the sky *suddenly*, as a Plus Lightning Flash from cloudland earthwards. And the gaseous, correlated Cloud form is seen leaving the sky as a sudden shower of characteristically thick, heavy, liquid, thundery Raindrops, falling earthwards. The calm ensues, close after the storm, because there is now no more abnormal Drought, on land and flora, there is now no more abnormal Moisture Cloud, in the sky. The calmed air of the sky is as far waterless, cloudless, and dayshineless; and the calmed land and flora, as far watered and dayshineful, as is their Norm to be. From the waterless land and flora, in the thundery landscape, the drying pitch of dayshine, the shine that was parching and contracting them, has passed skywards, as Minus Lightning, and has actually there contracted suddenly vast masses of thunder clouds, into the thick thunder rainfall, from the cloudful sky. The higher pitched, gasifying dayshine that was expanding the waters into Clouds has passed landwards, as Plus Lightning, and has expanded the dry, contracted, parched forms of land and flora with the liquidity or the moisture of the Rainfall. The dayshine that leaves the land and flora skywards, in thunderstorms, is the Minus pitch of dayshine, or it is the shrunken or the shrinking form power; and a very great form Expanding power leaves the cloudful Thunder skies, when a very specially thick mass of thunder clouds suddenly contracts and liquefies into a very specially thick mass of thunder rain, in very still or sultry thunder air. The Lightning which we see flashing from the sky is, therefore, Positive, that is, a very strong Form Expanding Force; and as such it will tear asunder or expand violently many things it may meet in its earthward path; but this Lightning is in its ultimates over accumulated midsummer dayshine and nightshine of the Expanding pitches in the sky: and the Lightning that Science knows leaves the land and flora for the skies in thunderstorms, is Negative, that is, as strong a Form Contracting Force; and as such it will also over contract or kill many things it may meet in its skyward path; but this Lightning is in its ultimates over cumulated midsummer dayshine and nightshine of the

Contracting pitches on the land. But as contracting force is more unobtrusive than the expanding force, the Minus Lightning sprung from the land and flora, is more easily overlooked in the aspects of Thunderstorms.

It is chiefly through the Waters of the sky and land that then occur these oscillatory give-and-take dislocations, passages, and exchanges of these midsummer plus and minus dayshines and nightshines, of these plus and minus lightnings, of these plus and minus forms; for the land and sky Waters best attract and radiate these special dayshines involved in thunderstorms; in fact, there is Water diffused and diffusible throughout all the Theatre of all the phenomena of thunderstorms, Water in all the forms and thermalities necessary for the molecular oscillations of force and form in the Ethereal Medium which develop the lightnings; and Water is, therefore, known to be one of the best Conductors of this Pitch or Type of Electricities.

We have argued that the plus and minus midsummer dayshines, that the plus and minus Electricities or Lightnings, or that the plus and minus *Cosmical Heat* and *Light* concerned in thunder and lightning storms, result from a disturbance in the course of the links of dayshines that start as *Surfeits* from the Oxynitrous or Carbonic acid airs. Consequently the Stabler Air itself is *Outside* the links of the phenomena of thunder and lightning storms. The oscillatory exchanges in plus and minus dayshine force that develop lightning, occur only among the dayshines that have left the Oxynitrous or Carbonic acid Air for good, or that have been surfeited and repelled by the Stabler airs. The oscillatory plus and minus form exchanges that accompany Lightning occur in the form of the Waters, of the Land, and Flora; as also the oscillatory plus and minus force exchanges. Stabler Air is, therefore, an Outsider or a Non-conductor of Electricity; the Electric Oscillations of force and form occur in a Pitch of form and force below those in which the extremely gaseous Oxynitrous and Carbonic acid air forms and forces can oscillate. Before, during, and after Thunderstorms we see little Difference in the Stabler Air except that it is very still and sultry. It is the Sky and Land Waters and Land and Flora that oscillate freely in these pitches of the dayshine, and that change and equilibrize by thunderstorms.

CHAPTER XV.

RESULTS OF DISTURBING QUINTESSENTIAL FORM.

PRESENT in the Shapecraft of the Earth, constantly and everywhere oscillating in links in the peripheral earth's Ether and Ethero molecular matter, exist Two Forces or Motions in polarity. A Sidereal shine power, oscillating with a Planetary shine power, a Centrifugal motion with a Centripetal motion, a form Expanding power with a form Contracting power, a Gasifying, Positive power with a Solidifying Negative power; and the Two Forces, or Motions, act on matter through *Matter's Character*, and, *therefore, must act on Actual Ethero Molecular Matter itself.* The forces are one planetary, the other sidereal; and one force goes while the other force is coming and meeting it in Oscillations, analogous to the Oscillations of sound; and in various sizes and rarities of Ethero molecular matter, and in various lengths and speeds of Oscillations. These two forces, are, therefore, polar or inseparable motions: like two locked Athletes they struggle without rest, weariness, or victory, only for equality or preponderance in Ether or ethero molecular matter's Quintessential Forms. The Expanding Force, in many grades of preponderance, polarly meeting the Contracting Force; and the Contracting Force, in many grades of preponderance, meeting the expanding Force in Ether and in Ethero molecular matter, are oscillating, and balance each other in many oscillatory grades in Ether; and becoming statically localized or latent as the form and colour pulse in Actual Ethero molecular matter, produce the Homologous Quintessential Form Scale of the earth; passing correlatedly from the *molecular* to the *molar* forms of matter.

Whenever, therefore, the Integrity of the Quintessential form in matter is meddled with; whenever you *in the Slightest Degree* either contract or expand, harden or soften, densify or rarefy matter; or *in the Slightest Degree* alter, up or down, the state change point of matter, either chemically or mechanically, you dislocalize some of the forces that are statically making Quintessential Form in the Actual Ethero Molecular Matter into or from the omnipresent and omnipenetrating free Ether; and you there make these forces sensible, either in the Electric or Thermal Phases or Manifestations.

If you in the slightest contract the Quintessential Form of *actual* ethero molecular matter, then the force that gave to that form the expansion of which your contraction deprived the form is dislocalized into the elastic all-permeating, omnipresent Ether, and there makes itself sensible as Plus heat, or as elsewhere disposable Molecular Expansion Power. If you expand in the slightest the Quintessential Form of *actual* ethero molecular matter, then the force that gave the form the contraction of which your expansion deprived the form is dislocalized, and makes its appearance as cold or contraction, or is heat or expansion borrowed from Neighbour Forms, and ultimately from the Plus forces of the Shapecraft, which are the forces and forms of the Sun and Stars.

Hence if you contract a form you do not thereby destroy any Expansion Force, but you merely dislocalize it, and send it on in Ether for a tour of other Expansions throughout the actual matter of the World. If you expand a form you do not thereby create Contracting Force, but only dislocalize it from the free omnipresent and omnipenetrating Ether from the Highway of the photothermal forces, and from the Matter of the World and Creation.

The Forces of heat and cold appear, or are made sensible, or are dislocalized, during all Quintessential Formation and Transformation in matter, even of the very slightest, and howsoever brought about, either Mechanically or Chemically. Hence Heat and Light, Cold and Shade, will most specially appear during Chemicalization, for then the molecular Quintessential Forms, the expansions and contractions of ethero molecular matter, are changed, and quickly oscillated or bandied about, amid the free, elastic Ether, like a ringing or form-changing or form-quivering Bell sounding in Air. The Sound is sensible in Air; the Heat and Light in Ether, and by analogous Oscillations. From such chemical actions, we have during action, and temporarily, heat and light, cold and shade, and finally the forms of the actors are shaken down to new stable shapes; or the actors are said to combine.

Heat and light, cold and shade, may also arise, generally in less degrees, even during the *Mechanical* Agitation of ethero molecular matter, as by Blows, Compression, Friction, etc., on matter; for mechanical force or agency affects matter's Quintessential Form and Form Pitch rudely and irregularly, but still strongly; and the Compressing Mechanical Force dislocates Plus Heat from a form or from a form pitch change; and the Unpressing Force dislocates Cold. And the Fountain-head of this Heat and Cold, and plus and minus forms, being ultimately the Cosmical Shapecraft or the sidereal heat and the planetary cold and gravity pressure for the Whole Earth, the Heat, the Cold that can be tapped from forms and form pitch, even by Mechanical Means, is practically exhaustless.

If you narrow and dwarf the Photothermal Force to heat and light alone, or to cold and shade alone, or to the petty needs and feelings of Man, or to the ken of his workshops, of his pyrometers, thermometers, photometers, then, indeed, is the August Photothermal Force or Firemight shorn of its true and boundless majesty and value. Not so, however, if it dawn in Science that the sidereal and the planetary shine powers are the Giant Springs of the Firemight, which in oscillatory static balance with each other in *actual* Ethero molecular matter, and in free Ether evolve the Quintessential Form and Photothermality of the Earth—evolve the Dayshine and Nightshine, and the Shapes and coloured Loveliness of our Home, the Earth.

In that case the Photothermal Force, the Firemight, will not only warm and light our humble Hearth and give us the coveted Steam, the Smelting, the Mechanical and Chemical Servant Powers, but the Firemight will do more, and will uphold in its tremendous and soft Grasp the Quintessential Form and Beauty of a tiny Atomy, and likewise of its integral World; and from this World the Shine Power Forces wing and overspread the Solar System, and then the Universe.

CHAPTER XVI.

THE SPECTRUM.

THE Sun and Earth shine powers meet throughout the Globe, and meeting in the Air Ocean, etc., throw its Nitrogen, Oxygen, Carbonic acid and Water, etc., into ethereal and ethero molecular oscillations, perceived by man as the heat and light and the transformations of the world. All the Airs in the air ocean are volatilized and more or less commingled and shining, the Oxynitrous air violet-blue, the Carbonic acid (probably) blue and yellow, and the Waters yellow and red; and they all commingled together shine with the White light and heat of Dayshine. These form and colour pulses of the Air ocean's Atomies occur amid an Ether which can copy them, and that is therefore, pulsating in correlation with the form and colour-pulses of the Air Atomies themselves—an Ether that permeates all things, and permeates right through Glass as well as Air. If, therefore, you place a Glass Prism in the dayshine or airshine you have the Ethers permeating the Glass Prism and the air Continuous; and you have two continuous Ethers that can take each other's pulses, and the prism glass Ether takes the pulses of the air Ether, and consequently copies or continues them as well as the greater cramping densities of the Glass over Air allows; and the Prism is said to refract the Dayshine into a Spectrum. The enormous mass of the Air Ocean is volatilized and partially incandescent in the huge Fire of the dayshine, and will consequently give a Spectrum with those fires, just as any other solids volatilized in any fires give Spectra. This Air Ocean's Spectrum must contain shiny and dark regions, like any other Spectrum; but this Airshine Spectrum has the shiny regions broad and multiplied, because the Air Ocean is *oceanic* in size and the most *perfect* in shining, and the Dayshine fire is also large and fierce. The Spectral colours that are a few, shiny lines in Artificial Spectra of most chemicals, are broadened out into the many and wider rainbow colours in the Air chemicals; and the Spectral darkness so preponderatingly large in Artificial Spectra of most chemicals, are reduced in this Airshine Spectrum into Lines called after Fraunhofer. For this is a Spectrum of the Dayshine or Airshine, a Shine that lights, not a Laboratory-room, but a World; this is a Spectrum of chemicals that are in ultimates the Organic Elements, and that are, therefore, the best Torches in the Earth, the best Holders of Light, Heat, Form, Colour, and Life in the Earth.

The Air Ocean in its Spectrum, however, shines lower and higher than the Rainbow colours; for the Air Ocean is not homogeneous, but contains a *Scale-like* Graduation of forms, contains pergaseous Nitrogen, gaseous Oxygen, subgaseous Carbonic acid, and easily-solidifiable Water or unstably-gaseous Water. The Air Ocean, therefore, can shine down towards the Solidifiables or Cold and Shade, and can also shine up to the very Gasifiables or the Highest Light and Heat; and both these *Extremes* in Cosmicality are unobtrusive to Man. The very gasifying

Region or Clef of the Spectrum belongs to Nitrogen, and is called the Ultra-violet, and is, if in Cosmicality, totally unobtrusive to Man. The Solidifying Region or Clef of the Air Spectrum belongs to the Water, and is called the Ultra-red; but in the Air Spectrum this Region cannot sink very low, for the air is gaseous; but even such as it is, the Ultra-red is so far unobtrusive to Man that He, though watery himself, ceases to see Light in it, but perceives it only as Heat, even if in Cosmicality. The deepest Ultra-red of the Spectrum for the Whole Earth man ignores, if it be in Cosmicality, as completely as he ignores the High or the Ultra-violet; in other words, of the Cosmical Spectral Force that hardens and persolidifies Carbon man is utterly unconscious. With the very Solidifying or the very Gasifying Forces of the Globe in their Cosmicalities man cannot identify himself or physically perceive; his chemical Character forbids it. Man, therefore, totally ignores alike the Extreme Ultra-violet Force that pergasifies Nitrogen, and the Extreme Ultra-red Force that persolidifies Carbon, provided the Forces be in Cosmicality. If the Extremely Solidifying and Gasifying Forces be in a local State of concentration, and touch man, they kill him with Overcold or Overheat. To be safe, man must keep the limits of Middle forces and forms; man cannot become Pergaseous or Persolid and Live. By his Chemical Character, however, man is preserved from the Cosmical Nitrogenous, Ultra-violet heat of the Spectrum completely, although actually the Strongest Heat in Earth; and by his Chemical Character man is preserved from the Cosmical Carbonaceous cold completely, although actually the Keenest Cold on Earth; and by his Instincts and Feelings man shrinks and is preserved from these Extreme Forces in their, to him, very dangerous Local Concentrations.

But not only Air, but each Chemical of the peripheral Earth has it own chemical or shine character. All Chemicals have their Spectrum, provided they be put into the same condition and position as the sky Air is during dayshine; provided the Chemicals be volatilized and incandescent; but no Chemical has the varied, the complete Spectrum possessed by the Chemicals of the Air Ocean, for the Air chemicals are in ultimates the Organic or Life-housing Chemicals, and they as such have vivid colours or shines, not only in Air, but over the earth, as the Organic Compounds. Some Chemicals, like Sodium, can only shine in the Middle or Yellow pitches of the Spectrum, like musical Instruments of small Compass; and the Pitches of shining or the Spectral Lines of Chemicals may not correspond to those of Air, but rather fit into some of the dark, Fraunhofer's Lines, which are Faults in the Air's shining; for though Air is our best Shiner, still it is not a *faultless* Shiner.

The Chemicals of the Air are thoroughly commingled Mechanically in the sky; but not only so, those Chemicals can also be most thoroughly Chemically commingled over the Whole World in their many Organic Compounds; and they are, therefore, very fast mechanical and chemical friends in Sky and over Earth. And their Rainbow colours in the sky Dayshine are generally most thoroughly commingled into White Light; and so difficult are they of complete Separàtion that, even when refracted into a Spectrum, the colours of the Air chemicals still partially commingle in their confines, the Red of one Air with the Yellow of another thereby making Orange; the Yellow of one Air with the Blue of another making the Green of the Spectrum. For the Test of Refraction, therefore, the Spectral Orange, or Green, or the Secondary Colours are homogeneous, but not for all other Tests. These Air chemicals can blend well, and the blendings, not only of their shines or the secondary colours, but of their forms, the organic compounds, are to some Tests, quite homogeneous, but not for all Tests; for when the secondary shines, and the secondary forms, or the compounds that appear so homogeneous are analyzed they prove unhomogeneous. Brewster so analyzed the spectral shines, and found the Spectral-green, like all other Greens, made of Blue and Yellow or of Primaries; found the Spectral-orange, like all other Oranges, made of Yellow and Red or of Primaries; and Chemists have also analyzed all the Organic Compounds or all the secondary forms or compounds of these Air chemicals into the primary or elemental forms. All colours are in ultimates resolvable into Three primary colours or their blendings—into the tonic-red, the mediant-yellow, and the dominant-blue or their blendings. And the like holds in Quintessential Forms; all forms in ultimates are resolvable into Three primary forms and their blendings—into the tonic solid form, into the mediant liquid form, into the dominant gaseous form and their blendings, or allotropy-like pitches.

We argue, therefore, that the Spectrum which Science calls the Solar Spectrum belongs only in part to the Sun's Shine power, and belongs equally to the Earth's Shine power; belongs, also, to the Ether, and also to the Ethero molecular matter of the Air Ocean. The so-called Solar Spectrum, we submit, except Fraunhofer's lines, is but a refracted, epitomized Picture and Copy in Ether-pulses of the form and colour-pulses of the commingled mass of the Four Chemicals of the Air Ocean, which are Nitrogen, Oxygen, Carbonic acid, and Water Air or

Vapour. We have, therefore, in the Spectrum Four Regions or Clefs that are distinct, but that are also more or less intermingled. The Highest Clef belongs to Nitrogen; the Next to Oxygen; the Next to Carbonic acid; and the Lowest to Water.

The highest Clef of the Spectrum is the Ultra-violet, and is very unobtrusive; for it belongs chiefly to Nitrogen, which is itself very unobtrusive in the Air, both in its Form and in its Actions. Nitrogen in the skies is retiring and quiet, does not shove or jostle us or the world, or takes little part in the turmoil and pother of the Earth; and Nitrogen and its Spectrum is paid back, and are unheeded by Man and the World; most men and most of earthly mineral things are unconscious of sky Nitrogen and of the Ultra-violet Clef of the Spectrum that chiefly shapes and dyes Nitrogen. Coming, however, down the Spectrum, you reach Clefs belonging to Oxygen, to Carbonic acid, to Water, and these Chemicals assuredly take much part in the Earth's Dayshine's Doings, and the World reciprocates and Man perceives them vividly in the White Light, in the blueness, yellowness, redness of the skies; and in the Spectrum likewise, at first faintly in the violet, then better and better in the blue, yellow, red lights and in the ultra-red of the Spectrum itself, as Heat. With those lower chemicals and forces Man and the world's Commonality are more directly identified, or are more at home, are more in unison, and are therefore more alive to them. For Oxygen, Carbonic acid, Water, together with the Fauna and Flora of the Earth, are in the very thick of the Dayshine's mighty and best Chemistries, and all of them are seen to oscillate in Earth's dayshine and nightshine, most perfectly, both molarly in physical action, and molecularly in chemical actions or as the Dayshine itself.

This Dayshine Spectrum is therefore Aërial, or contains in epitome the Picture in Ether of the form and colour-pulses of the Whole of the chemicals of the Air Ocean, in the Order of the scale-like pitches of their pulsations. The form and colour-pulse is of the Highest pitch or refrangibility in the nitrogenous gaseity, thence it descends in pitch gradually or scale-like to the lower pitches of the oxygenic gaseity, thence descending into the pitches of the carbonic acid gaseity, and ending in the lowest refrangibilities, in the pitches of water's gaseity, by which the Aërial Spectral Pulse pitch approaches or is linked to the Liquidity and Solidity pulse pitches more common in the rest of the Non-aërial Earth-globe. The lowest Spectral pitch is dark, and called the ultra-red, and belongs chiefly to Water; and from this dark ultra-red the Pûlse Pitch rises in shortness and quickness, in a scale, into the Red, Orange, Yellow, Green, Blue, Indigo, Violet, and lastly into the Ultra-violet, pitches. In the Spectrum is therefore contained black cosmical heat, red, orange, yellow, green, blue, indigo, violet, white cosmical heat, and the heat beyond, or the ultra-violet heat. And corresponding to those heats, we have the cognate Forms of matter, the form of Water gaseity, which approaches the closest to Liquidity and Solidity, and we have the Middle pitched gaseity, that of the carbonic acid, and next the Higher pitched gaseity of oxygen, and finally the Highest Natural Gaseity on Earth, the Pergaseity of Nitrogen. In other words, the dayshine's Spectrum in completed Compass contains the Epitome of the highest heat on earth, the Rainbow coloured heat, which can be blended into a Chord of heats, called White heat; and, indeed, contains the still higher heat of the Ultra-violet spectral pitches; and this great Spectral Dayshine Heat lives side by side with the correspondingly most heated Forms of the Earth-matter, which is the Air Ocean, consisting of the subgaseous Water vapour form, the mediogaseous Carbonic acid form, the gaseous Oxygenic form, and the pergaseous Nitrogenic form, in the Air Ocean.

The Dayshine and Nightshine are a great Cosmical Fire in which the atmosphere or the Air Ocean and its Belongings, the waters and lives of earth, are perheated above the other more compact Commonalities of Earth. And the Air Ocean contains the highest heat on earth, as proved by burning Glasses and Mirrors, as is proved also by air's intense gaseous forms and vivid colours, and by its watery and living Dependants. But the White heat and even Ultra-white heat epitomized in the Spectrum, is Cosmical or wide-spread, regular and perennial, and is therefore offered to all Earth-matter indifferently, but can only be taken through character, and therefore can only be appropriated by Air and Air's likes or belongings, the Stable Gases or the Gasifiables, the Waters and the Organisms of earth, few of which, except Air itself, exist gaseous extensively and native on Earth. The water vapour in the Air Ocean is the most unstable Gas in that ocean, and can solidify even in the sky, as snow; sky water, therefore, forms the link between the very Stable Gases of the air and the Commonality of the more compact earth. In the Clefs of the Spectrum in which the sky water's pulsations are copied, from the Yellow down to Ultra-red, the Pitch of spectral pulsation is being slowed down to those suitable for the Commonality, or slowing down to our thermometers' appreciating powers. These thermometers therefore ignore the far greater cosmical gasifying heat of the Violet and Ultra-violet Nitrogenous pulses, and tell us only of what they can find, which is some of the Watery pulses more kin to their own; and the lower the water pulses get or the more ultra-red they be, the better will the usual Thermometers perceive them. And the most accurate thermometer or the most delicate thermopile are unsafe guides to the true forces of the Cosmical Spectrum.

Although the Force epitomized in the Spectrum is so vast as to overspread the Universe, yet it is a most simple and unvarying force in its Principles. It is throughout a pulse-motion, and nought else, consisting of Three Primary pitches, the Red, the Yellow, and the Blue colours, or pitches, or refrangibilities of the Spectral Force, or of the Firemight. These Three Pitches are, however, better considered and styled, the red the Tonic, the yellow the Mediant, and the blue the Dominant pitches of the Spectral Force, or of the Firemight, after the Music or Sound Force. For these Three pitches are not always to be perceived objectively or coloured red, yellow, and blue, because these pitches can be octaved down into so low a Bass-like pitch, or up into so high a Treble-like pitch, that the pitches, though always present and the same in principle, may cease to be characteristically coloured or objectively perceived by man, who may then think them different, and may give them different names.

We repeat, the Tonic, Mediant, and Dominant pitches of Spectral Force recur constantly octaved up or down, blurred into chords, throughout a Wide Compass, but so recurring in octaves or so blurred, the pitches may get very objectively unobtrusive in many of their high or low repeats, or octaves, or clefs, or blurs, or pitches, and they in such states are only perceivable in their *Spectralness* by the mind's eye; or they constitute what Melloni aptly calls the *Ideal Coloration* of heat. In the Spectrum, therefore, in its Full Compass, we have obtrusive or shiny, and unobtrusive or unshiny forces, yet the two forces do not differ in the spectral principle of pulse-motion, or in Spectralness; all these phases of the Spectral Force can be construed into a scale of pulse-motion, and differ not in principle, but in pitch or refrangibility only. In other words, the present Division of the Spectrum into Three Portions is artificial and misleading.

In the cognate spectrum of Quintessential Forms, in its Full Compass, we have correlatedly the obtrusive Solid form, the less obtrusive Liquid form, and the least obtrusive Gaseous form; and the matter in these phases or guises does not cease to be matter and to depend on the form and colour pulse, but differs only in the Quintessential Pitch.

The Dayshine or Nightshine that quintessentially shapes and dyes the peripheral matter of the Earth, consists of pulses in Ether, arranged in a very extensive gamut of pitches, as is seen even by the Refraction of the Dayshine through a Prism. The shapes and dyes of the peripheral earth-matter are correlated to the Pulses in Ether, and in Ethero molecular matter, and are also arranged in as an extensive a gamut of pulse pitches, producing in matter not only Solidity, Liquidity, Gaseity, but their very numerous Pitches or Allotropies and Colours. And the chemical character of matter fits the matter to a certain momentum of shine or spectral pulses, and the Pulses fit the Character. And if you have low, bass-like, slow, long and sluggish pulses, in the spectral shine force, you have to correspond to them, the cognate low, bass-like, slow, long and sluggish form Pulses of Solidity, and so on. The spectral shine pulse and the form pulse fit each other in Nature, or are cognates or correlated; and rise, the shine from blackness into all the colours of the Rainbow and beyond; and the form rises also from a dense, or hard and badly fusible Solidity through all the series or homologous scale of Quintessential Form to extremest Gaseity and beyond into Ether. And the Spectral Shine Pulse, the pulse in Ether, ends in a very unobtrusive or shineless shine, called the Ultra-violet, whose very existence was indirectly and even haphazardly made out. And the Quintessential Form pulse, the pulse in matter itself, correlatively ends also in a very unobtrusive Form, called Hydrogen or Ether; for we, while actually handling Hydrogen, neither see, nor smell, nor feel it; and Hydrogen's existence is only indirectly made out.

But the objective unobtrusiveness of the Ultra-violet shineless Spectral Force and the objective unobtrusiveness of the Hydrogen's unperceivable Form does by no means necessarily indicate Weakness or unimportance or essential Change in that Spectral Force or in that Quintessential Form, as compared with other spectral forces and other quintessential forms. In one sense the easily-overlooked shineless Ultra-violet force of the Spectrum is the very Strongest Force on the Earth-globe; and the easily-overlooked Hydrogenous Form is the most Powerful Form in the World. For in the Ultra-violet spectral force we have the extremest gasifying power that explodes or expands the Nitrogen of the Air Ocean or Atmosphere with more than Dynamitic power. And in the soft and most unobtrusive Form of Hydrogen we have housed the very Strongest Combustion or Fuel-power on this Globe.

CHAPTER XVII.

THE SPECTRAL FORCE.

The Agent that cosmically chemicalizes the Earth is a Pulse Motion in Ether and Ethero-molecular matter, and is analogous to the Agent that musicalizes the world, which is a Pulse motion in Airs and Molar grosser matter. Both the chemicalizing and the musicalizing Pulses have a Wide Compass, and there are but few things that play or radiate through the Whole Compass of either these two great pulse forces or motions, except the Ether in Chemistry, and the aërials in Music. Consequently, if you consider this chemicalizing Agent to be heat alone, you fail to conceive it fully, for in that case you take a Part of the agent for its Whole, since this Agent is not only heat, or treble-like pulses, but also cold, or bass-like pulses. If you consider this Agent to be only fire or shine, or only heat with light, you miscarry likewise, since you still take a Part for a Whole, because this Agent is also cold and shade. Neither can you take this Agent for the plus and minus Electricities; it is, indeed, all that, but more besides, since in Chemistry this Agent is the plus and minus Cosmical heat, the Cosmical heat and cold, and the Form-expanding and the Form-contracting Agent in the Earth's Shapecraft.

Nor can you simply call this Agent the Earth's dyer or colourer, for it not only colours matter, but also decolorizes matter; the Agent blackens or whitens or tints matter. Nor is this Agent solely the expander or gasifier of matter, since it also contracts and solidifies matter. In short, there is as yet no Wide enough conception of this august Agent, no name for this Briraeus chemicalizing power, consisting of a wide rising and falling Gamut of pulse motions in the Ether and Ethero molecular matter of Earth, of the Solar System, and the Universe, whereby the Earth and the Universe are shaped, dyed, and photothermalized; and until an apter name appear I will call this Agent *The Spectral Force;* the Airshine Spectrum itself being the best or ready-graduated thermometer and photometer for the highest terrestrial Spectral Force; that, namely, which expands portions of this Earth into gases or which boils our Air Ocean; for of the complete Earthly Spectral Force we obtain in the Airshine Spectrum only the highest pitches—Pitches which are used in shaping and dyeing the Forty Miles Deep Air Ocean that encases the surface of the Whole Earthglobe, in shaping and dyeing this Air Ocean's Belongings on Earth, consisting of her vast Waters and her Vitalities. The Earth's Airy, Watery, Floral, Faunal kingdoms are bound indissolubly together, and move best *molecularly* on Earth or in the highest pitches of Spectral Force, and these great Classes of matter move also best *molarly* on Earth. The Air, the Waters, the Plants, the Animals are in constant *molar* motions, and have the most expanded heated and vividly-coloured forms and structures—that is, are also in intense *molecular* movements.

The liquefying pitches of Spectral Force are observable in the lower pitches, even, of the Airshine Spectrum, for the Airshine contains the shine of Water, and that is liquefiable and solidifiable, even in the sky Air. But the very solidifying pitches of Spectral Force, those, namely, that persolidify Carbon on Earth, are awanting in the Air Spectrum, but are present very distinctly in the Spectrum of the Carbon Electric Light.*

Physical Man, Nitrogen, Hydrogen, Carbon have very different Chemical Characters, whereby in the dayshine and nightshine blazing around us there is always for Nitrogen's Character a most terrific expanding Force, namely, the Momentum of the cosmical Ultra-violet Force, the merest Tithe of whose power we note in Dynamite; for this Force expands and explodes, not only pounds of Dynamite, but that Forty Miles Deep Air Ocean that encases the Whole Globe—a Cosmical force, therefore, of the greatest power, but also of the greatest modesty or unobtrusiveness, and necessarily in its Cosmicalities utterly ignored by Man, by free Carbon, nay, by the Average mineral matter of the Earth; a Cosmical force, the Privilege chiefly of lordly Nitrogen, which the force ennobles to be the Positive or Father chemical Element of Life. To this Most mighty Force, so indifferent to Man or Carbon, all Nitrogen is a willing slave, since no Nitrogen nowhere ever loses the Essential Strain of its Character. All free Nitrogen on Earth, this mighty force, though modest, holds exploded as the greater portion of the Air Ocean or Atmosphere of this Globe; and all freed, or nascent, or weakly-compounded Nitrogen this Force-Talisman tends to explode at once with dynamitic power into the air ocean; and through the Nitrogen employed in the stabler Organic Animal Structures this mighty force gives the great Positive powers of the physical Life.

* Tyndall on "Heat."

But the Cosmical Spectral Force for the Whole Earth has a Wide Compass, and does not consist only of the treble-like or the gasifying pitches found abundantly in the Air Ocean and its Spectrum, but consists also of bass-like or solidifying pitches. For the Earth, taken as a Whole Globe, is in part only gaseous, the rest of her globe is part liquid and part solid, and the Mean Earth Globe is, indeed, solid, or a bass-like Player. The Spectral Force active throughout the whole globe, therefore preserving always its Spectralness, or its pulse character, descends from the upper treble-like gasifying pitches, to the middle liquefying pitches, and thence to the lowest, the bass-like, solidifying pitches of Spectral Force. And the Spectral Force for the Whole Earth goes much deeper than even the extremest Ultra-red of the Dayshine or Airshine spectrum, as is evident in the Electric Carbon-light spectrum, etc., whereby in the Dayshine and Nightshine around us, there is always for Carbon's Character, a most terrific, contracting, cosmical force, namely, the Momentum of the Cosmical *Infra* ultra-red Spectral Force, a mere tithe of whose contracting power we note in the extreme hardness of the Diamond. For this force it is that greatly helps to bind or contract the Whole earth globe together into its mean, hard, solid form. A Cosmical Force, therefore, of the greatest power, but also of the greatest unobtrusiveness; and necessarily, in its cosmicalities, utterly ignored by man, by free nitrogen and by many things besides—a cosmical force, the privilege chiefly of the Gem Carbon, which the force ennobles to be the Negative, or Mother, Chemical Element of Life. All free Carbon on Earth, this mighty force, though modest, holds contracted, for all free Carbon is a willing servant of this power, since no Carbon nowhere ever loses the Essential Strain of its Character throughout its manifold Organic Compounds. And free and most characteristic Carbon, this Force-talisman holds enthralled as a hard but sparkling Gem, or as a black persolidity; and all freed or nascent Carbon, this force at once chills or contracts into solidity, oftenest into smoky solidities or allotropy.

The Quality and Intensity of the cosmical Spectral Force for the Whole World, or throughout its Cosmical Compass, cannot be trustworthily indicated by man's mere feelings or senses, or by those of any single matter, or thermometer, pyrometer, photometer, or thermopiles, however perfect within its limits each be. And the degrees of Spectral Force are best measured and indicated by the Wave length, beat, and amplitude. The slowing, lengthening beats, the narrowing amplitudes, in all Spectral Force betoken intrinsic Minus heat, or the cooling pitch, the minus Spectral Force pitch, the form-contracting, or the form-solidifying power. And contrariwise, the quickening, shortening beats, the widening amplitudes, betoken in all Spectral force intrinsic Plus heat pitch, the plus spectral force pitch, the form expanding, the form gasifying power. But the degrees of the Spectral Force may be more objectively but roughly and partially indicated, by the colour and the colour vividness of the Spectral Pitches, by the Rainbow colours; Black heats being the lowest or the coldest heats, and the Bright White heat being practically the highest heat or Spectral Force pitch on Earth.

CHAPTER XVIII.

ACTIONS OF THE SPECTRAL FORCE.

TYNDALL, with memorable skill and care, examined the Spectrum experimentally. He chose not the Solar Spectrum, which is rather the Dayshine Spectrum, which is rather the Airshine Spectrum, but principally the Carbon electric-shine spectrum. But we submit that the carbon electric light and heat Spectrum, and that the day's or the air's light and heat Spectrum are analogous in character and development. During day, the Air Ocean's Ether and Ethero Atomies are bandied to and fro between two opposite poles and currents, the Solar pole and current and the Earthly pole and current; and between these Coming and Going currents, the solar Plus and the earthly Minus, the Air Ocean's Atomies, because they have a special capacity, radiance, conduction plasticity, and weight—a certain shine tuning—pulsate or oscillate, into shine, and into form and colour pulse, and will give a Spectrum with the special Clefs and Pitches peculiar to air and airshines or tuning. Placed in a Galvanic current Carbon's Ether and Ethero Atomies are bandied to and fro between two opposite poles and currents, namely, the Plus pole and current and the Negative pole and current of a Battery, which is a *local and intensified* Analogue of the day's Sun and Earth poles and currents; and Carbon's Atomies because they are very plus and minus capacious, very plus and minus plastic, very plus and minus radiant, plus and minus conductive, plus and minus or medium weighted, or are tuned to Wide Compass—Carbon's Atomies themselves can pulsate or oscillate into a very fine or into the Carbon shine, which will give a Spectrum with the special Clefs and Pitches peculiar to Carbon and Carbon's shines or tunings.

But it is evident that Nature has tuned Air and Carbon differently. Carbon is tuned fundamentally to the bass-like pitches of shine; and Air to the treble-like pitches; Carbon is persolid, Air is pergaseous; Carbon is intensely Black, air is intensely or vividly Violet-blue; the Strain of carbon throughout Chemistry is coerced Contraction, the Strain of air is coerced Expansion. But though Carbon is tuned to bass, to blackness, to solidity, still Carbon, like a Violoncello, can rise high or up even to the treble Clefs, or Carbon can also take the Treble shines, the Vivid Colours, the Gaseous Forms; and Air, though tuned to treble, can also sink low or down even to the bass Clefs, or Air can also take the fading colours, and the solid Forms.

And the special Characters of Carbon and Air seen throughout the Earth and Chemistry are seen also in their Spectra. The Carbonshine's Spectrum of the electric light and heat goes down much deeper in pitch or refrangibilities, or has Four times more of the Ultra-red or of Darkness or of the Bass-like pitches in it than the Airshine's Spectrum of the daylight and heat. In Tyndall's Diagram of the Carbonshine Spectrum there is a Matterhorn Mountain of Darkness to a Hillock of rapidly lessening Brighter Shines.*

Tyndall farther isolated and concentrated the abounding slow, long, dark *Infra* ultra-red pulses of Spectral Force which he found in the Spectrum of the Carbon electric light; and Tyndall had then at his command very low pitches or refrangibilities of the Spectral Force belonging to this Planet; and, moreover, Tyndall had a very Refined and Perfect Way of subjecting matter to special heat pitches. And by those means it was found that the denser and harder Solidities, such as Platinum, Metals, and Carbon itself, identified themselves with these *Infra* ultra-red spectral pulses, radiated them better than the Carbonless, lighter, softer Solidities, such as Sulphur and Phosphorus. These pitches of Spectral Force are, in the key or in the central compass, of free, hard, black, persolid Carbon, and the heavy, persolid Platinum. Carbon free, therefore, and Carbon in all its Compounds of *the Solid* Strain identifies itself well with these pulses, or will radiate this pitch of Spectral Force, as Tyndall found and described.† For Carbon and Platinum in Nature herself fundamentally radiate these very pitches of the Dayshine Spectral Force by preference, and will radiate them also in Tyndall's Laboratory and Artificial Spectral Force; all the more that in the laboratory, for small time and things, these pitches can be nearer and more concentrated than even the Dayshine's Force. Carbon and Platinum, therefore, in the Laboratory radiate them in a more amplified and intensified way, or become Red hot in them. But it is different with *Oxynitrous* air. For Air is a treble shine Instrument, Air's Atomies and Molecules are measured, thickened, tightened, weighted, or nature-tuned, or Charactered, not to pulsate deep bass-like notes, or the utter black Spectral Force, but the trebles or the vivid violet-blue or still higher shine notes or the very highest form and colour pulses of the Spectral Force. Consequently for the Air Thermometer there is little available force in the Key of the isolated *Infra* ultra-red of the very low Carbon Spectral Force. Air does not absorb or radiate the very dark or low-pitched bass heat, the dimmer colours, and the cognate more solid forms; as was indeed proved by Tyndall himself; and as is still better proved in the Air Ocean of the Earth's Skies, where the *Oxynitrous* Air shines or oscillates, pergaseous in shape and perviolet-blue in colour, by the transmitted Dayshine and Nightshine.

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* Tyndall on "Heat," p. 433.

† Tyndall on "Heat," Lect. xv.

Matter is, indeed, tuned by Character to heat pitches as matter is tuned to note pitch; and Air or the Piccolo will not play bass. Air, Water, Carbon are each as a shine Instrument, and each has its special Compass or Key of shine notes. And Carbon, Water, Air each plays in three different clefs of shine; and the heat pitch that makes Carbon red hot or that is in Carbon's clef, will not melt Ice, or affect Air.*

In other words, if you cross-question in Tyndall's Refined Way, or by heat Siftings, or by his Isolated, concentrated *infra* ultra-red pitches of spectral force, the Chemicals, Air, Water, Carbon, Platinum, Sulphur, Antimony, Phosphorus, Bismuth, etc.—nay, the Chemical called Man himself—each will have his own steadfast opinion about what is loosely called heat and light, since each has his own Spectral Lines or his own key or Beloved Congenial Heat Pitch—each his own photothermal Character and weight. To your Refined Cross-questioning each Chemical answers confidently, but each after his own Key or Fashion or

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* Tyndall on "Heat," p. 463.

Powers. Tyndall questioned Carbon or Wood by Sifted heats, and It told him stoutly that there was a red heat or that there was actually *Fire,* where Water kept telling Tyndall as stoutly, that there was *Hoar frost* or *Ice cold.** But this is what is happening in Nature around us, where it is matter's Character and not Tyndall that Sifts the heat. In the same Dayshine and Nightshine and Climate, in the same spot of the same Field, together grow the red Poppy and the yellow Wheat, the Bane and the Staff of Life—for you will say that the one is the Opium-yielding *Poppy* and the other is the Bread-yielding *Wheat,* and that the Wheat and Poppy differ in Character. In the same Dayshine and Nightshine, in the same Climate and Laboratory spot, likewise together grow the persolid Carbon, the liquid Water, and the parboiled Air, just because they are Carbon and Water and Air, just because each has a special Character that makes them appropriate from Nature's impartial forces the special force and form of each. It could not be Otherwise, and if you overlook *the Character* of matter you are landed in a Maze of flat and startling contradictions. Tyndall, with his usual skill and with greater courage, questioned his Eye and Retina and Platinum about heat and light; and that fine sentient organ told Tyndall that there was Cold and Darkness, where Platinum, on the contrary, found Fire or vivid red heat.† But, on the other hand, Fluorescents will maintain that there is light in the Dayshine Spectrum, and the Fire-fly that there is light in the Nightshine Spectrum, where Platinum and Man himself report mostly Darkness.

There is no way of reconciling these numerous and puzzling contradictions unless by conceiving the Dayshine and the Nightshine and Analogues to be *Spectral Force,* which consists of refrangibilities or much rather of Shine Notes or Pitches, with their Chromatic Scales, their Chords, their Octaves, and their Clefs, to which Ether and Ethero molecular matter are by character strictly attuned, like Voices, Strings, Bells, and Musical Instruments; and as No musical Voice or String or Bell or Instrument plays in the full Compass of Music, so no Matter radiates or plays in all the Clefs or Portions of the Spectrum or Spectral Force. A Spectral Force that cannot otherwise be divided, and that cannot be construed by man's mere physical perceptions, nor by any single thermometer—a Spectral Force of pitches revealed by the amplitudes, the length, and quickness of the spectral undulations, or more roughly by the Rainbow colours, and most roughly by the Quintessential Form of matter. Solidity, blackness, small amplitude, long and slow undulations, indicating the true colds of nature, and *vice versâ.*

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* Tyndall on "Heat," p. 463.

† Tyndall on "Heat," p. 449.

CHAPTER XIX.

MAGNETIC ANALOGIES OF SPECTRAL FORCE.

THE complete Compass of Terrestrial Spectral Force begins at the Lowest ultra-red pulse, which matter of the free Carbon and free Platinum types can radiate. Below this depth of pitch Spectral Force is ignored by Terrestrials; not because very *Infra* ultra-red spectral pulses cannot exist in the Spatial interplanetary Ether of the Solar System, but because they cannot exist on Earth as long as she retains her present Mean Morphigenic Thermal Force. These very long and slow Spectral pulse pitches may, however, affect the very hard, unmeltingly solid matter of the Moon, although they be powerless on the more liquefiable, gasifiable, softer matter of the Earth.

The Terrestrial Infra Ultra-red spectral pulses are long and slow, as if in ultra-bass-like Clefs, and are, in Cosmicality, very unobtrusive; but as the pitches ascend they quicken and shorten, and then pass into the more frequent ultra-red, the red, orange, yellow, green, blue, indigo, violet, and ultra-violet Spectral notes or colour clefs or regions, up to which the Earth's stable Gases and Gasifiables can radiate them, but above which the pulses are not only unobtrusive to most, but

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ignored by all, Terrestrials. Not because very *Supra* ultra-violet Spectral pulses cannot exist in the Spatial interplanetary Ether of the Solar System, but because they cannot exist on this Earth as long as she retains her present Mean Morphigenic Thermal Force. These very short and quick Spectral pulse pitches may, however, affect the lighter and more meltable matter of the exterior Planets that have thick Atmospheres and Rings, although the pulses be powerless on the heavier and less meltable matter of the Earth; for I submit that as it is not the same Spectral pitches that suit all the matters of the Earth, it is not the same Spectral Force pitch that suits all the Planets of the Solar System.

The long, slow pulses of Spectral Force can be taken up only by the Ethero Atomies of the most sluggish or pulse-stilled-matter, and that is matter in Solidity. The dense or heavy solidity is a sluggish, the hard solidity is a hampered, the infusible and insoluble solidity is an unwilling, Molecular Mover or Oscillator; and so they all take the long, slow pulses of Spectral Force. These very slow, long pulses in Spectral Force cannot abound in the Airshine Spectrum, because it is a Spectrum of native Gaseous matter. But we would expect, and find actually, more Abundance of such pitches in the Carbonshine Spectrum or the Electric arc light. The Spectral pulse of Medium length and speed no longer drives or bandies the sluggish or the hampered or the unwilling Solidities of Earth, but suits the more rarefied state of matter called Liquidity, whose Archytype is Water. And Such Pitches begin to appear in the Airshine Spectrum, in the lower or in the Water Clef, or at the lower Yellow, at the Red, and at the Ultra-red. The still shorter and quicker pulses of Spectral Force bandy or drive Ethero Atomies that are dilated and thinned into Gaseity; and These Pitches abound in the Airshine Spectrum, and reach up to the extreme Ultra-violet; but, being in Cosmicality, in airshine they are appropriated only *through character*, and are, therefore, obtrusive only to stable gases or gasifiables, and are quite unobtrusive to the Rest of the matter of the Earth.

On this view, the Force lodged in the Whole Compass of the Terrestrial Spectral Force is extensive, but one in Principle; it is an Oscillatory Motion; the bandying terro-solar force in Ether, thence transferable or radiatable to all Earthly Ethero Molecular Matter according to its chemical Character or Tuning; and, *vice-versâ* transferable from Ethero Molecular Matter back to the ether; and also transferable by Conduction, or more immediately from matter to matter, in analogy to the Music, or Sound force, or motions. And sustaining the musical analogies, the Spectral pulses are arranged in rising or in falling pitches, like the Chromatic Scale in Music, and also like the Homologous Series or scale of Quintessential Form in matter; and, lastly, arranged like the Distribution of forces in a bar Magnet. For the Bar of the Spectrum and the Bar of the Magnet have two ends or poles and a middle. At the lowest, ultra-red End or Pole, the Spectrum has the slowing, the contracting, the solidifying motions of pulse-force, and corresponds to a North Pole of the Bar Magnet, if the Spectrum be likened to the Bar of the Magnet. At the highest Ultra-violet End or Pole the Spectrum has the quickened, the expanding, the gasifying motions of pulse-force, and corresponds to a Magnetic South Pole. And between the two ends or poles the Spectrum tends constantly to force blendings or neutralizations, also in analogy to the Bar Magnet. We learn, therefore, that the dayshine and nightshine, to which the Earth-globe is subjected, has a Magnetic scale and polarity, and that they shape and dye the Earth-globe itself in a Magnetic scale and polarity.

The Earth-globe itself, before the Westward currents of dayshine and nightshine, is both photothermalized and shaped magnetically. From its Outermost air surface to its rocky Depths the peripheral Earth-globe is perpendicularly arranged in the magnetic, spectral, scale and polarity. For sinking in our Air Ocean, from its Surface towards its Depths, or from Space Earthwards, we first get the thinnest Air, which, as we near the compacter Earth, gets very gradually denser and denser, until close to the Earth the Air thickens into half Water, with its Cloudy moistures. From watery Air we pass to the more liquid Waters themselves, and from them to watery Fauna and Flora, the best or highest Blendings of Water, Air, and Solidity on Earth; and from them we pass to the watery mineral Solids, those, namely, that are soluble; from them we pass to the softer disintegrated Solids, from them to stratified Rocks; and, lastly, to the deep, primary, hard unstratified Rocks, which contrast much with the airy Outermost parts of the Earth-globe. In other words, the peripheral matter of the Earth-globe has a Perpendicular Magnetic-like Scale and Polarity—a south Sky air-pole, and a north, rocky, Earth-Crust-pole, and a Blending of the earth forms and forces between. And I submit that this perpendicular magnetic-like polarity of the periphery of the Earth-globe, which Flora so distinctly and pertinaciously Obeys, results from the Westward currents of the Dayshine and Nightshine, and not from Gravity alone. But besides this Perpendicular earth Polarity, the dayshine and nightshine induce on the Earth-globe a horizontal magnetic Arrangement from Pole to Pole; and like a spinning-top, the Earth-globe has an upper bulky condensed end or Northern hemisphere, and a lower thinned end or Southern hemisphere. For along the Bilge of the Earth-globe, skirting the great Circles, from pole to pole, we find the solid, hard, dense, infusible Land massed in the Northern Hemisphere and towards the North pole, and the firm Land tends to lay itself Lengthways and to taper Peninsularly Southwards throughout the Earth-globe. In other words, Contraction of the cosmical force, form and pulse occurs throughout the Earth-globe Northwards. In the South and Southern Hemisphere of the Earth-globe, ocean Liquidity, Icy or Soft Solidity, even lighter than water, prevail. In other words, comparative Expansion of the cosmical force, form and pulse, occurs throughout the Earth-globe Southwards.

But not only is the peripheral Earth-globe arranged magnetically or polarly, perpendicularly, and horizontally, but its peripheral matter is closely packed and firmly held in the Magnetic Polarity and Arrangement; for were it otherwise the Earth-matter would not hold together in the Globular form when turning fast about her Axis and round her Sun.

I submit that on the peripheral Earth there is a close, firmly-packed Plenum of pulsating, magnetically arranged etheroatomies, which can force certain Characters of Earth-matter into corresponding Position or Polarity. Thus the Trees are forced to grow in the perpendicular magnetic-like polarity of the Earth, and seemingly against gravity, because the chemical Character of the mass of chemicals that compose Trees fits into this magnetic-like polarity, or makes the tree adapt itself to the positions of their composing Air, Water, and certain Solidities on the Earth; these Chemicals themselves that compose trees having a similar position on the Earth-globe. This Plenum is further seen by the universal Impressibility of matter, and by Moser's Images; and, as we submit, also by the Selective Attractions of the more acknowledged magnetisms, and of electricity, and of chemistry. What magnetizes the Earth-globe is its shapecraft's shines through the globe's Character. Any earth-matter that has a Character the epitome of that of the earth-globe, or that omniradiates its forces and forms, may be magnetized, like the Earth-globe itself; but such quality of matter is not numerous.

The radiation of Oxygen is the most perfect or extensive on Earth. For Oxygen is found on Earth in all her forces and forms, from the Persolidities of the depths of her Crust, to the Pergaseities of the heights of her sky Air. In Oxygen there is the Earth epitomized in force and form scale; and consequently Oxygen's Magnetism is the most perfect on Earth, for Oxygen alone is singly stably magnetic. Carbon's radiation is also extensive, but Carbon in cosmopolitan conditions is found in Flora and Fauna, or only in the higher forces and forms of Earth, and Carbon is also Magnetic, but imperfectly or not singly, but only when its Radiation is complemented, eked out, or filled up, extended downwards by that of heavier and lower radiating Iron. Iron, also, radiates in 470 Spectral lines, but radiates only in the lowest Spectral Clefs of the Earth, and Iron is also Magnetic, but imperfectly so, or not singly, but only when Iron's Radiation is complemented, eked out, extended upwards, or filled up with those of Oxygen or Carbon. Soft or pure Iron is incapable of permanent, or the complete, or perfect Magnetism. The native Loadstone is an Oxide of Iron, the permanent Magnet is a Carburet of Iron or is Steel. Oxygen only is capable singly of stable

Magnetism. Iron conducts and multiradiates in 470 spectral lines, or in a very Wide Spectral Compass. But Iron, being heavy (7·8), and having a 27 Equivalent, multiradiates in low base clefs of Spectral Force, and always within the Solidity of its form. We see, however, by the pasty, shrinking of white hot Iron under hammer blows on an anvil, how heat, or shine, or Spectral Force can bloat out and soften iron's form, even within the limits of Solidity. On sudden, quick blows Iron strikes or radiates fire from the Shapecraft, so sensitively perfect is Iron for the shines of Earth. A similar sensitiveness to low-pitched shine and form, a magnetizing sensibility, is felt by Iron in its Atomies, and bloats out or shrinks in the Iron Atomies in correlation with the Spectral Force of the Earth-globe, but within the limits of solidity and molecularity, so that the magnetizing force and form changes in Iron are not obtrusive. Placed in shine currents which make the Earth herself a magnet, or placed in analogous shines, Iron, conducting, radiating in low clefs, weighted, and capacious like the Earth, Iron itself becomes magnetic or assumes unobtrusively a molecular form and force polarity analogous to the Earth, and may swing into the Magnetic Meridians. For I conceive a thin bar of Iron, like everything else on the periphery of the Earth, to be in a unified, compact, magnetically arranged Plenum of Ethero molecular-matter, pulsating in Ether. The packing pressure that Atomies receive from each other in this compact Ethero-matter pulsating Plenum, is considerable, but is as unobtrusive as the somewhat similarly compact pressure upon us from the Air Ocean, at the bottom of which we live. This pulsating Plenum pressure unobtrusively varies in different parts of the Globe; the pressure rising Southwards and falling Northwards.

In the direction of the compact Plenum's minus pressure, the Earth-globe's ethero matter Atomies are dilated and pulsating in more expanded forms, and in shorter, quicker pulses; and in the direction of the compact Plenum's plus pressure the Earth-globe's ethero matter Atomies are pulsating in slower and longer pulses, and in more contracted forms. A Bar of Iron while unmagnetized and swung will assume any position in the Earth-globe's compact pulsating ethero matter Plenum; for all the Atomies of the Bar are of the same size and of the same pulsation. But as Iron radiates and conducts well molecular force and form, the Atomies of Iron will radiate in relation to the forces and forms of the magnetic Plenum of the Earth-globe, and becomes thereby what is called magnetized. And when an Iron bar is so magnetized, there arises in it the greatest molecular pulsatile dilatation at One End or Pole, decreasing scalariformly towards the Other End or Pole, where there arises the greatest molecular and pulsatile contractions, and thence decreasing scalariformly to the First End or Pole of the Bar; there is therefore in a magnetized Bar of Iron the greatest molecular pulsatile contraction at One Pole and the greater pulsatile expansion at the Other; and a *molecular* and therefore a greatly *unobtrusive* Contraction or Expansion. And Midway in any spot of the Bar there is a mingling Balance of the contraction and expansion, a seeming Neutralization of forces; and if the magnetized Iron Bar be swung in the Earth-globe's own compact pulsating magnetic Plenum, the Bar will oscillate parallel to the position of least resistance, amid the pulsating ethero atomies of the globe's Plenum, at right angles to the Dayshine and Nightshine currents; that is, the Bar will place itself along the Great polar Circles of the Globe that sweep round the North to the South poles, and the Dilated end or pole of the bar will dovetail into or towards the Contracted end or pole of the Earth-globe, which is the North pole; and the Contracted end or pole of the bar will dovetail into the Expanded pole of the Earth-globe, which is the South pole. And the nearer the Bar Ends get to their respective Earth poles, the deeper will they dovetail, or sink in, or dip into those Poles, the Contracted Magnet Pole fitting into the Expanded Earth Pole, and the Expanded Magnet Pole fitting into the Contracted Earth Pole. The Opposite Poles in Earth and Magnet dovetail into each other by the firm Push of the compact pulsating Plenum around them; the Two Poles do not therefore actually attract each other; and the similar Earth and Magnet Poles repel each other because their pulsations find no dovetailing Room to occupy.

On this view, we seem to have, in rough, an Explanation of the magnetic needle's Dip, and North and South direction, at right angles to the Dayshine and Nightshine currents. I know not whether there lurk any deadly objection against this View, and we will adopt it also for the Explanation of the Selective Attractions of Electricity and of Chemistry. On these views there is no Occult or Mysterious force specially Magnetic lodged in the Iron; the Force that magnetizes Iron, that magnetizes the Earth herself, is ultimately the Spectral Force of Dayshine and Nightshine; and these are assuredly not the sole property of Iron, but belong to All Things or to the Universe. For the Force that magnetizes Iron is the Dayshine and Nightshine, and is not housed in Iron alone, is not housed in the Earth alone, and is not housed even in the Sun alone, but flows eternal through all the vast masses of the shine and matter of the One Universe. What alone is Special in

Iron, and in that sense Magnetizes it, is its Chemical Character, specially its Multi-radiance. The *molar* movements of Magnetism are obtrusive. We easily see the Magnetic Needle moving in its totality; but the *molecular* pulses in the ethero matter Plenum that push the Needle into its molar motion are very unobtrusive to us. But the Motion of the tossing tree-branches, and leaves, by the Push of air or the Atmospheric Plenum, or by the Wind, somewhat elucidates this Phenomenon, or is in a measure analogous to the motions in swung Magnets. For if we saw for the first time, from shelter, all the Cornheads in a field bending to the breeze, I am sure that we would ascribe all the Motion only to the Corn itself; for sheltered we would be unconscious of the Wind. And in this case we might suppose that the bending Cornheads were Attracted to the Ground by an inherent bending Force. Even with our knowledge, the motion of the breeze is so comparatively unobtrusive when compared with the motion that the Breeze gives to Ships and Vegetation, that we readily forget or overlook the breeze when seeing the sailing ships and the dancing tree-leaves, at some distance.

CHAPTER XX.

THE SPECTRAL OR SHINE FORCE.

The power that chemicalizes the Earth is, therefore, the Spectral Force of the Dayshine and Nightshine. It is a pulse force of a wide Compass and several Clefs, like that of the Music force, and finds on Earth and also throughout the Solar System, and, indeed, throughout even the Universe, not one but many Instruments. Each Class of Earth-matter, the Airs, the Waters, the Flora, the Fauna, and the Lands, is as a shine Instrument. And each Instrument has its strict shine Compass, or its own capacity and Spectral lines. Nor can the Earth's thorough Bass sing Treble, nor her Sopranos Bass. Each Man-like or each Child-like voice, each Matter, has its allotted sound and shine Key, its score and parts. And thus the Sun and Earth, Apollo and his Lyre, play unceasing Pæans, and sweet Symphonies, to the rapt Angels, and to Such as be their distant Kin on Earth, for ever and for ever.

The Phenomena that most surround and strike Man in the physical world, the Phenomena of Man's and Nature's Chemistries, that is, the fires, the electricities, the matter changing, of Man's promptings and Nature's making, occur chiefly in those clefs of Spectral Force whose pulses are throbbing through the Solidities, the Liquidities and lower Gaseities of Earth. In the aërial Nitrogen of the Earth there appears less striking transforming changes than in the Earth's Oxygen, Carbonic acid, Waters, Flora, Fauna, and Lands. Water is constantly form changing, and strikingly on the Earth's surface, and in her clouded Skies. Flora and Fauna are also ever and strikingly changing their own forms and that of air or sky Carbonic acid and Oxygen, from Birth unto Death. And the Land forms of Earth are also changing, but more slowly. But the azure depths and heights of our Nitrogenous Firmament in high Heaven persists more unchangingly, or less agitated, by the chemical oscillations such as those that stir Oxygen, Carbonic acid, and Water. Not that Nitrogen is powerless, but that it is calm and heavenly strong. For Nitrogen is potentially the strongest nature-made or native matter on Earth. And the mere fact that Nitrogen is a Special Essential of the highest Life proves it, to me, at least. But Nitrogen uses his strength generally so beneficently and unostentatiously that Man under-values Nitrogen; unless when, perchance, Nitrogen's dynamitic wrath shatters Man's toys or Man's self into Nothingness.

The Stars are Suns and the Earth a Planet. For the Earth, therefore, there exists the Stars' sunbeams, and the Sunbeams themselves, and the Earthbeams; or, put more concisely, there exist sunshine powers and planetshine powers in everlasting Antithesis and Union. And we submit that those Sunbeams and Earthbeams, the sidereal and planetary shine powers, are the photothermal forces that together quintessentially shape and dye, and that together photothermalize the peripheral matter of this Planet Earth. The Sunshine powers and the Earthshine powers, therefore, claim and deserve the concentrated and prolonged Thought of the chemical Mind; and, moreover, these Shine powers are in themselves the most noble and gladdening of all the physical Themes of Thought. For the gorgeous Sunshine powers and Earthshine powers flooding the landscapes of Earth, warm, light and exhilirate all things, or awake and display with the Magic forces of their beams the Shape and coloured Loveliness, the Joy and the Life of the teeming Earth.

And we are taught that the Creator Himself is the God of Light or of all Shine power. And, verily, something in Man, be it Mind or Soul, learns easily, and allows prostrate, that HE which planned, began, and is wielding the oscillatory motions of the Firemight or of the Spectral Force of Creation, sustains an Atomy, and may extinguish the Whole Universe at His nod.

And, happily, out of the munificence of the Oceans of the Universe's Shines, chemical Thought need separate, at the behest of Theory, but a small Ray of the Earth's Dayshine. For a single tiny Ray of the Earth's dayshine claims kindred with the Ocean Splendours of the Universe, and has the claim allowed, like the tiniest Dewdrop and its parent Oceans. And with the solution of the Problems in the Ray and Drop, we may solve some problems of the Ocean of Waters and of the Ocean of Shines in the Universe of God.

In other words, a Ray of Dayshine refracted through a Prism into the beauteous Spectrum may show us some secrets of the vastest, strongest, and most beneficent Force in the Universe; a Force experimentally proved by Grove to produce in enchainment all the Forces of Chemistry and her Belongings; a Force of a Universe, and that is, indeed, God-like.

CHAPTER XXI.

THE PERCEPTION OF THE PULSE MOTIONS.

An earthly Atomy, or Sets or Molecules of earthly atomies, negative or positive, embedded in the all-permeating Ether are struck alternately, very quickly, by Sidereal advance, and Planetary recoil motions, are struck by the Pulses of the Spectral Force of the Shapecraft of this planet; and the Atomies themselves take on from the blows analogous motions or pulses amid and together with the Ether. And Atomies and Ether collectively or correlately pulsating give us the perception of the every-day Form, Colour and Photothermality of our Being and surroundings.

And the Mechanism and Art by which the pleasing warmth, the shapes, the coloured loveliness of our Earth and our Existence is conveyed to us, has much analogy with the Mechanism and Art by which the pleasing musicalify and the sounds of Earth, are also conveyed to us; and we live and joy by thrilling identified with the Form, Shine and Sound Pulses of the Earth and Universe around us. Through the open channels of the ear, the eye, the other senses, the frame and the mind we drink in freely on all sides Pulses from graduated varieties of matter, and of the most varying lengths and speeds, and We Ourselves pulsate into Being, throbbing, not only with our Hearts, but molecularly with every Fibre of our Frame. For enchained from the Universe to the Earth, and from the Earth to the Universe, Pulses in Ether and Matter are ever flowing, giving us and all the Universe the Rapture of Life. And thus I cling always fast to the analogies of the Sound pulse to the Spectral Pulse, for by this Analogy alone do we obtain the best clues to the Shine Force.

The Sound and Spectral Pulse to be characteristically revealed to us must beat in certain Links. Matter masses (a Bell) must pulsate With Airs to reveal sound to us; matter Atomies (Electric Carbon) must pulsate With Ether to reveal perfect shine to us. We do not perceive characteristically, that is, we do not *hear* the sound pulses *as sound*, if they be confined or localized to the grosser matter only; we do not hear the sound pulses that do not extend from ringing grosser matter to ringing lighter airs; we do not hear a Bell that is ringing with all its might in an Airless Place or *in Vacuo*. The Bell does not cease to ring *in Vacuo*, but it is ringing only potential sound—a sound that is *latent* or hidden to man—until the very moment that the Bell's Quiverings quiver in Airs also; then the potential latent sound from the Bell that rung *in Vacuo* becomes *sensible* sound.

In an analogous manner we do not perceive characteristically, or as *unusual* heat and light, those Pulses of potential heat and light that are localized or beating in the Form and Colour Pulses of the Ethero Atomies of matter around us; for these Pulses serve only to give us the *accustomed* impressions and aspects of Things around us. The moment the accustomed order or forms of things is disturbed mechanically or chemically, then these accustomed Pulses are dislocated and exchanged for others in

Ether, and by the Ethereal correlated Pulses are revealed to us as unusual light and heat, being always accompanied by obtrusive or unobtrusive Form and Colour changes in some Matters around.

Sound Pulse may be radiated from sounding pulsating Air to soundless Grosser Matter, and in this case the receiving Grosser Matter must have a special pulsating Character, called Tune or Tuneableness; and Sound Pulse may be also radiated from sounding pulsating Grosser Matter to soundless Air; and Sound Pulse, also, may be developed by Blows of gross matter on tuned matter, as by the Clapper on the Bell.

And all these properties of the Sound pulse find parallels in the Spectral pulse. The Spectral pulse may be radiated from shining pulsating Ether to shineless Ethero Atomies of matter, as from the Dayshine or Nightshine to peripheral matter; and in this case the receiving Ethero Atomies must have a special pulsating character, called Spectral Lines, etc., which are the shine tuneableness or compass of matter. The Spectral Pulse may also be radiated from shining Ethero Atomies to shineless Ether, and Spectral Pulses may also be propagated or *conducted* by blows of the Ethero Atomies of one Shine attuned Matter on those of other Matter. The Airs radiate or play every pitch of Sound, for we may hear through a Theatre's Air all the many instruments and voices of the fullest Orchestra, singing from the deepest basses to the highest trebles. The Ether radiates or plays every pitch of the Spectral Pulse; pitches, indeed, much deeper and much higher than any played in this Planet. But the Grosser Matters play only in limited pitches of Sound Pulse; and the Matter's Atomies also play or radiate limited pitches of the Spectral or Shine Pulse. The

Ethero Atomy of Stable Gases itself radiates the highest pitches of the Spectral Force, and not the low, which are Dark Heat, for this is a necessary condition of Stable or Native Gaseity on Earth. And the more unliquefiable or the more stable the Gas, the worse it radiates the Low Pitch or the Dark Heat, and the better it radiates the High Pitches; but the Ether in the Pores of all Stable Gases radiate equally well all the Pitches, High and Low, of Spectral Force. If you apply Dark Heat from 0° to 100° C. to Stable Gases, you dilate *the Atomies* of very unliquefiable Gases scarcely anything; you dilate *slightly the Atomies* of the more liquefiable Gases, but you dilate with Pulses the Ether in the Pores of all Stable Gases alike; you therefore dilate Stable Gases nearly alike by dark Heat or by driving with purely Ethereal Pulsations their Atomies bodily asunder; and a slight increase of dilatation then accrues to the liquefiable Stable Gases, because the very Atomies of such share or partake somewhat, though slightly, the Ethereal dilatation with the Dark Heat.

But the Darker Heat from 0° to 100° that the Atomies of Stable Gases, say those of Air, do not radiate, or that they reject or surfeit, is the very Heat that the Commonalities of the Earth radiate, or appreciate, or appropriate; hence our Atmosphere seems diathermanous to the so-called Sun Heat, and the Atmosphere is also diaphonous to the Sunlight, because in the Atmosphere itself lodges the so-called Sunlight.* It is the Air itself that Shines, incandescent in Straight lines with the Sun's Disc, and more mildly elsewhere, or throughout the Vault of Heaven and around us.

When you Heat matter you Heat its poral Ether first, for it is the Ether that is best at being heated; and you thereby increase the Temperature of the Matter, and you at the same time drive the Atomies of the matter bodily asunder, or you dilate the matter. If you still continue to increase the Heat you may reach a pitch in which you also Heat the Atomies of matter themselves, and then, besides the dilatation, etc., you have allotropizations or oftener state change in matter. As long as the Poral Ether is alone heated, you have only, or chiefly, the superficial effects on matter of heightened Temperature and Bulk, and it is only when the Atomies of matter themselves are heated or take on the Oscillatory or Heat pulse that the Deeper, or the Allotropizing or the Chemical, or the State changes in matter appear in addition to the shallower, and partly at the expense of Temperature; for what pulse is gained by the Atomies is lost to the Ether, and *vice versâ*. Hence Temperature always disappears in these state and chemical or allotropizing changes.

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* Tyndall on "Heat," p. 489.

CHAPTER XXII.

CORRELATION OF FORM, FORCE, AND COLOUR.

THE Quintessential Form in matter is correlated to the Pulse Force epitomized in Spectra, and the Pulse Force in the Spectra themselves is correlated to Three chief colours or pitches—to Red, Yellow, and Blue, which are the chief *Shine* notes, and are in their turn correlated to the three chief notes of the Music scale—to the Tonic note, to the Mediant note, and to the Dominant note of the scale. From these Three colours, from these Three notes, all the other colours and notes are derivable by intercalations or interminglings with each other. The Quintessential Form, since it is correlated to the Spectral Force, is correlated to the Three chief Spectral Colours, and to the Tonic, Mediant, and Dominant notes of Music, so that the Quintessential Form itself consists of Three chief forms. The Tonic Form, the most contracted form, the best type of which is Solidity, the Tonic or Fundamental form of the Earth herself; the Mediant Form, a balanced Middle between Solidity and Gaseity, between contraction and expansion, the best type of which is the Liquidity of the Waters; the Dominant Form of the Air, which, rising highest into the Skies, "cases" and Dominates over the rest of the Earth-globe. From these three chief Quintessential Forms—the Tonic, the Mediant, the Dominant—all other forms on Earth are produced.

Lessen the heat capacity, modify the Character of wood Charcoal, and you will contract and harden it, you will allotropize it into a Diamond. Charcoal and Diamond are the same Matter, but with different Characters, and the different Character has sufficed to change much the aspects and properties of the two Carbons. Modify the Character of the Charcoal still further, and give it the Character that Sulphur has, and in that case you will also dilate the Charcoal, you will allotropize it into Sulphur itself. The difference of Charcoal from the Diamond is so great that it warrants the assumption that Charcoal would actually become Sulphur if you changed its Character befittingly—for Character, I have argued, has Paramount influence over Matter's form. All the Solidities of Earth, therefore, are derivable from one Solidity, that has been more or less contracted or expanded by a Character change. If Solidity becomes softer, or lighter, or more fusible, that Solidity has, as it were, taken some Liquidity into its shape, having taken expansion, which in sufficiency would quite liquefy the Solidity, and *vice versâ*, and *mutatis mutandis*, the same is true of Liquidity and Gaseity; and by so acting, Solidity, Liquidity, Gaseity are allotropized into all the Elements and Chemicals in the World. But this Character-changing power in the absolute is beyond Man's power; or there is no transmutation of Matter possible for Man's Arts.

CHAPTER XXIII.

CORRELATION OF FORCE AND FORM.

THE Quintessential Form of Matter has a Pulse motion correlated to the pulse motion of the Spectral Force. The Quintessential Form has, therefore, a similar force or a potential momentum similar to that of the ethereal spectral Pulse itself. The Force Pulse is communicable or radiatable from pulsating Ether to suitably charactered matter, and from pulsating matter the Force or Pulse may be communicated or radiated to the Ether around, and to other matter; this mutual interchange or interradiation being paralleled in the Sound Motion or Pulses in the Musical Force; Ether or Airs alone radiating all the Pulses in their respective Forces, or in Shine and Music.

Form Pulse, however, is Force static or localized in matter, made latent by Occupation in matter's Formation and Coloration; and such Pulses are disengaged or dislocalized from matter to Ether, and thereby made sensible to other matter and ourselves, by change in matter's Form or Form Pitch and Colours. Chemical Form or Form Pitch Changes are always accompanied by give-and-take motions in matter, bandying motions in two or more

[illegible] an intervening, very elastic Ether
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[illegible] bodies; and these enchained Oscilla-
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[illegible] Heat and Light and Form Change, or
[illegible] Combination. Quintessential Form,
[illegible] Chemical Character, is potential
[illegible] Force, and this Force is also poten-
[illegible]

[illegible] the Earth's Shapecraft, which
[illegible] and the Local and Cosmical
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THE Quintessential Form of Matter has a Pulse motion correlated to the pulse motion of the Spectral Force. The Quintessential Form has, therefore, a similar force or a potential momentum similar to that of the ethereal spectral Pulse itself. The Force Pulse is communicable or radiatable from pulsating Ether to suitably charactered matter, and from pulsating matter the Force or Pulse may be communicated or radiated to the Ether around, and to other matter; this mutual interchange or inter-radiation being paralleled in the Sound Motion or Pulses in the Musical Force; Ether or Airs alone radiating all the Pulses in their respective Forces, or in Shine and Music.

Form Pulse, however, is Force static or localized in matter, made latent by Occupation in matter's Formation and Coloration; and such Pulses are disengaged or dislocalized from matter to Ether, and thereby made sensible to other matter and ourselves, by change in matter's Form or Form Pitch and Colours. Chemical Form or Form Pitch Changes are always accompanied by give-and-take motions in matter, bandying motions in two or more matter Forms, along an intervening, very elastic Ether that takes up the motions, as elastic Airs take up the motion of Sounding bodies; and these enchained Oscillations between two qualities of matter in an intervening Ether constitute Heat and Light and Form Change, or chemical Action and Combination. Quintessential Form, therefore, viewed through chemical Character, is potential Morphigenic Thermal Force, and this Force is also potentially Form itself.

On and through Carbon, the Earth's Shapecraft, which consists of the Spectral Force and the Local and Cosmical Gravities, acting through a special Character in Carbon, exerts enormous contracting and hardening power. And when acting on Carbon Free, the Shapecraft acts its utmost, and is observed to contract Free Carbon into the hardest, blackest, most infusible and insoluble of Solidities. The Low Pitches of Spectral Force and the Plus Local Gravities can together almost extinguish Expansion in Free Carbon. And this Carbonic contraction, in the light of the Mechanical Theory of Heat, may be construed into intense Cosmical Cold and Shade in Free Carbon.

Carbon is the solidest, hardest, blackest element in Chemistry, for by its character Free Carbon either rejects or quenches most of the *blazing* Shines of the Dayshine or Nightshine. The Free Carbon in the Earth's Natural Cosmical Flames is either black with quenched Cosmical Light and Heat, and then Carbon is Coal, or sparkling with rejected Cosmical Light and Heat, and then Carbon is the Brilliant; and Carbon in intense Artificial Flames is always flaring with the local rejected Light and Heat of the Artificial Flame, and in fact Carbon gives the enlightening part of the Flame; in other words, Free

Carbon never houses or appropriates the Plus Light and Heat of the Earth's Shapecraft, but the Minus Light and Heat or the Cold and Shade. And we can trace this Contraction or this Cosmical Cold in Carbon, not only when it is free, but as a Strain throughout all Carbon's compounds in Chemistry. For it is by the Contracting, Cooling Power that the Earth's Shapecraft can exert on and through all Carbon, that the great expansions of Earth matter, known to Science as the Organic Gases, can be by Carbon and the Shapecraft, coerced, controlled, contracted, balanced, and thereby fashioned into means or into the many Quintessential Forms, known to Science as the Organic Compounds, which are the Forms into which Solidifiable Carbon essentially enters, united to Gasifying Powers. Extremely Solidifiable Carbon united to extremely Gasifiable Hydrogen—and the Hydrogen united to Carbon, can both lose in a gamut-scale or in a graduated homologous manner, their extreme and opposite Forces of Contraction in Carbon, and Expansion in Hydrogen, and can allotropize each other or can adopt from each other and the Shapecraft the many graduated homologous means of Forces, Shines, and Forms or Allotropies, between Extreme Contraction and Extreme Expansion, which are known to Science as the Hydrocarbons.

On and through Hydrogen and the Organic Gases, the Forces of the Shapecraft, that is, the Spectral Force and the Gravities, acting through a special character, to be shortly considered, exert enormous form-expanding, boiling, softening power; and when acting on Hydrogen and the Gases Free, the Shapecraft acts its utmost, and expands Hydrogen and the Gases into the softest of matters, and into the most unliquefiable gaseities on

Earth, and almost extinguishes Contraction and Cold in Hydrogen and the Gases; and these Shapecraft's actions on Hydrogen and the Gases is equivalent to intense or high-pitched Cosmical Heat and Light in all those Gases. Most assuredly Hydrogen and the Gases are very expanded matter; and this on the Mechanical conception of the Thermal Force may be construed into intense Plus Heat and Light in matter or in all these Gases; and we can trace this Expansion or Cosmical Heat in Hydrogen and the Gases, not only when they are free but as a Strain throughout all their behaviour and their Carbon Compounds in Chemistry. For it is by the Expanding, Heating power that the Earth's Shapecraft can exert on and through all the Organic Gases, that the great contractions of Earth-matter known as Carbon, and the contractions of the mean Earth herself, can be by the Gases and Shapecraft coerced, controlled, expanded and thereby allotropized or fashioned and balanced into the matter known to Science as Flora and Fauna, and the other Quintessential Forms of Organic Chemistry. The very gasifiable, expansible, heatable Nitrogen, Oxygen, Hydrogen, united or blended with the very solidifiable Carbon, and the very solid mean Earth, and *vice versâ*, both lose their extreme and opposite Forces and Forms, of contraction in Carbon and the mean Earth, and Expansion in the Gases, and allotropize each other or can adopt from each other and the Shapecraft, means of Forces and Forms, between every shade of Contraction and Expansion, and are then known to Science as Flora and Fauna, or as the Organic Compounds and Vitalities of Earth.

Consequently it is only when you greatly abandon the words and common ideas of Heat and Cold, and substitute for them the words and ideas of Spectral Force and of the Quintessential Form Force; of Ethero Molecular Expansions or Centrifugal Motions, and Ethero Molecular Contractions or Centripetal Motions, of Sidereal and Planetary Forces, oscillating and in oscillatory balance with each other, in Ether and in Ethero-matter, that you obtain a clearer conception of the Shaping or Chemic Force and of the Shaped Matter or Form in Chemistry. That you obtain, in short, the Broad or Mechanical Correlation Theory of Chemistry.

For the Cosmical Chemistry there is a Heat and a Cold in Matter—nay, a very Supreme or High Pitched Heat, and a very Supreme or Low Pitched Cold in Matter around us, that are in the best, but not in the accepted sense, by far the most Thermometric of Heats or of Colds—inasmuch as this Heat and this Cold in Matter around us are Indicated and Adjudged by Matter's Pitch or Degree of Expansion or Contraction, or by Matter's Quintessential Forms. And when we in Chemical Theory speak of Cosmical Heat or Cold, we mean the unmistakable Expansion or Contraction or the Expansibilities or Contractilities in Matter's Form and Form Pitch.

And when we say that Carbon is intensely Cosmically Cold we mean that Carbon as an Element is intensely contracted matter, and that Carbon in its Compounds, or as a Parent Form, is a Contracting Allotropizer to its Partners or its Offsprings. And when we say that Hydrogen is Intensely Cosmically hot we mean that Hydrogen or Oxygen or Nitrogen as an Element is Intensely expanded matter, and that in its Compounds or as a Parent Form Hydrogen is a Form-Expanding Allotropizer to its Offsprings or Partners in the widest sense, including even the Mean Earth; and so forth. The Form and the Form Pitch and

Character of the Element indicate in it its Cosmical Heat or Cold, its pitches of Morphigenic Thermal Forces, its Strain or its procreative allotropizing powers and behaviour, its Activities and Affinities in Chemistry.

Form is always the outcome of Force. You cannot make a matter form out of Nothing, even though the form be native on the Earth or be perfectly natural. The natural and unnatural, the simple and compound Quintessential Form of matter is made, however, not from one but from Two Forces, which we see clearly and widely present in Nature, or which are *veræ causæ* on Earth. One is the Positive Force that gasifies or expands matter, or vivifies or accelerates Molecular motions. The other is the Negative Force that liquefies, solidifies, or contracts Matter, or that slows and would kill Molecular motion. These Two Forces are as Life and Death, as Male and Female, and together and never separate make or beget all the Quintessential Forms on Earth. These two Forces may be equally present in a Form, and then they make Liquidity in that Form, the Middle Form for matter. But the Positive Force may preponderate, producing in matter the Positive Gaseous or easily gasifying Form. But the Negative Force may preponderate in matter, producing the Negative, Solid, or easily solidifying Form. And the Two Forces, even while making a Form, are not lost, though they seem to vanish, but they then become localized or statically balanced in Special matters, and in that condition cease to affect the Forms of other matter and our Own; they are latent, hidden away from us and Thermometers. A Form once made tends to keep made, and will not change of itself. Hence even the Unmaking of a Form, or a Form Change, develops or needs Force.

We repeat, in every Form there are Two Forces, which in their most Homely Guise are Heat and Cold, and which in their most Philosophic Ultimates are Sidereal and Planetary Forces or Shine powers. One of these Forces may preponderate, or both may be Equal in matter. And we see the fluctuations of these Forces most clearly and familiarly in Water, or rather in the Oxide of Hydrogen. In Ice we have the Earth or Planetary Cold preponderating in a matter Form, but in no wise extinguishing, but rather coercing, the Sidereal Heat there. In steam and Cloud Vapour we have Positive or Sidereal Heat preponderating in a matter Form, but in no wise extinguishing, but rather coercing, the Earth or Planetary Cold there; and in Water itself we can have no great preponderance of either Force, for in Water, if Cold much preponderates, Water ceases to be Water to become Ice or Solidified; and if in Liquid Water Heat greatly preponderate, Water ceases to be Liquid to become Steam. Moreover, in every Form there is the tendency to lose under favouring circumstances the Force that preponderates, specially if it greatly preponderates, for the most perfect Balance of Forces lies in their Local and Cosmical equality.

CHAPTER XXIV.

MAXIMUM DENSITY OF WATER.

THE Oxide of Hydrogen on Earth, which we name the Waters of the Earth, is in contact with a most extensive Surface of the Earth's Crust, or with much of the Earthly Solidities. The Waters are likewise in extensive contact with the Earth's Air-Ocean, or with much of the Earthly Gaseities, and the Waters are likewise in extensive contact with a very vast and continuous Cosmical Area of themselves. The Waters extend in a wonderfully perfect omnipresence and continuity over the Mineral, the Organic and Aërial Earths, Everywhere, over Land, Flora, Fauna, and Skies; so that even a Drop of Water is Cosmopolitan, or is in Sympathetic Touch with far-spreading Fellow Waters, in extensive Sympathetic Touch with the Solid Forms and Forces of Earth, in extensive Sympathetic Touch with the Gaseous Forms and Forces of all Earth, and at the same time, the Waters are Force and Form capacious and are Conductive. Water, therefore, in Nature viewed as a Thermometer, that is, as a Contractor with Cold and as an Expander with Heat, is a very peculiar Thermometer, or Water is a Cosmical or Cosmopolitan as well as a Local Thermal Contractor and Expander. In the commoner ranges of Earthly Temperatures the Cosmical and the Local Temperatures differ little or differ less; and though Water, since it is Cosmopolitan, must always, even in the commoner ranges of Temperatures, feel everywhere both the Cosmical and the Local Temperatures, still the two, being similar, balance and mask each other, and even Cosmopolitan Water, in such ranges of Temperatures, contracts and expands regularly, or like its more Localized Neighbours, or as our Betrusted Thermometers approve. But in Wintry Frost Cold or in Snow Lines the Local Temperature becomes more and more contracting, and the Cosmical Temperature relatively more and more expanded, but the Cosmical Expansion can be appreciated and shown only by that Thermometer which is Cosmopolitan, and marks Cosmical as well as Local Temperatures on Earth; and that Thermometer is found in Water alone. Consequently in Arctic Norway on the Snow Line Water is freezing, or has only reached 32°, when its Norway neighbours on the Snow Line, including Thermometers, have already got down to 26½°. That is, Water in Arctic Norway, on the Snow Line, is more EXPANDED than all its neighbours, or is indicating a Higher Temperature than all its neighbours; and this because Water, Cosmopolitan in Norway and everywhere, is marking Cosmopolitan Temperature, derived, mayhap, even from the Tropics; and it is this Tropical Temperature that enables Cosmopolitan and Sensitive Water to expand somewhat amid the general surrounding local contractions on the Norway Snow Line.

Again, on Equatorial Chimborazo's Snow Line, Water, on the contrary, is already freezing, or has reached 32°, when Water's more localized neighbours, Thermometers included, are only at 35°. Water on the Equatorial Snow

Progressive Force, and at the same time Cosmical room or a general, facilitating consensus is made for Water's dilatation by all its wintry, shrinking neighbours. Hence if you strongly press Water you annul this consensus or one of the facilitating conditions of Water's freezing; the Cosmical dilating Force meeting, in this case, a balance from the local pressing Force, retains Fluidity in Water; and strongly-pressed Water is more and more difficult to freeze.

In a thawing landscape all Water's neighbours get heated or expanded by the Thawing Heat quicker than Water, because all the Thawing Heat that Water's neighbours can get is appropriated by their local or selfish selves. Whereas the Thawing Heats that Cosmopolitan Hypersensitive Water gets, it shares not only with near surrounders, but generously with the World. Consequently Water in thawing in a landscape from 0° to 4° is much more difficult to heat up or to expand than its neighbours. In the thawing landscapes Water contracts, while everything around it keeps dilating, being pressed by them, while Water is being drained of its own expanding Force by the World; hence Water is also the *Most heat-capacious of bodies.* The Thermal, the Thermometric, the Contracting, and Expanding behaviour of Water about to freeze or freezing, so viewed, becomes intelligible without strained or Procrustean Hypothesis. The behaviour of Water a little before it freezes, and during actual icy solidification, is not a serious or fatal objection to that Mechanical Theory of the Thermal Force and of Chemistry that I seek to advocate and to elaborate. That is, neither Water nor any other thing besides, at no time or place, really contracts with Heat or expands with Cold. On the contrary, the behaviour of Water Freezing, and about to freeze, corroborates those Theories or Ideas. In the Expansions of Freezing Water, a great, because a Cosmical, Force steps in—a Force that shapes much of the actual World itself, namely, the Cosmical Temperature of the Peripheral Earth. Shortly before the Freezing, and by no means only during the Freezing or actual Icy Crystallization of Water, a Cosmical Energy is localized in comparatively small masses of Freezing Water and Ice, an Energy that shapes a World, and that has, therefore, might enough to snap with playful Ease most of the trammels that Man can arm against it.

The Plus and Minus Spectral Force or Heat Pitches, that give the Plus and Minus Quintessential Forms to water in Nature, are derived, the Plus Force and the Plus Form proximately from the three stabler Sky Airs; and water's Minus Force and Minus Form are derived from Gravity and the Solider Surfaces of the Earth. Ultimately Water is Warmed, Liquefied, Gasified by the Sun, and the Star Shine Powers, but only by such Shine Powers as have been first sifted through the stabler Sky Airs; and proximately, therefore, Water is Warmed, Liquefied, Gasified by the stabler Sky Airs; and water, therefore, is alike cooled by the scarcity of the stabler Airs, as well as by the scarcity of the Solar or Sidereal Shine Powers. When there is plenty of Sunshine Power, plenty of the stabler Airs, over plenty of Water, as in Mid Ocean in Tropical low Air levels, there the waters are most warmed or are expanded to their utmost Gaseity, and even to quite an Air-like form. But where Sunshine powers comparatively fail, the Earth's shine-power and Gravity relatively increase, as at both Poles, and there, even in dense low air levels, water solidifies into Ice and Icebergs, or obtains the preponderance of the Earthly or Planetary Force and Form of a Rock. Where the stabler Airs begin to be scarce, and thin, as either in Cloud heights or Mountain heights, one of the Warming or Expanding forces for Water, namely, the Air-sifted dayshines or nightshines, begins to be scarce also, and there Water can no longer retain the very highly Warmed and Expanded forms. On high Mountain sides and Snow-lines Water, being in close touch with the Strong Contracting forces and forms of the Solidities of Earth, can become the likest to the Earth, in the scarcity and thinness of the three stabler Airs; and on high enough Mountains, even at the Equator, or Chimborazo, at heights on which the Oxynitrous Air gets thin, and the Carbonic acid scarce enough, Water is Snow or Ice-Rock eternally. In Sky Cloud heights, however, Water is in the middle, not of Solidities, but of very intense Gaseities, in the middle of an Air Ocean, and although in Sky Cloud heights the Oxynitrous Air is thin and the Carbonic acid scant, still in Mid-air earthly Solidities are scant also. And Water, therefore, in Cloudland's scantier Solidities cannot contract in Form so much in the scant Airs as in the plenteous Solidities of High Mountain sides. In Cloud heights in the sky there is a region of Earth in which the balance of the Cosmical Contracting and Expanding forces for Earth is special, and Water can reach this Region, and is most Heat capacious or Plastic, and then takes the Mid-air special Force and Form Balance, and becomes allotropized into Cloud.

Water is exceedingly Heat capacious, that is, Water can turn Heat within it, not so much into mere Temperature, but into Form-Power. And with the exception of extreme Gaseity and of extreme Solidity, Water can sink or rise to many Forms, and entirely by self-contained capabilities. The Oxide of Hydrogen exists as the rock-like Solidity of Polar, Glacier, Snow Line Ice. The Oxide of Hydrogen exists as one of the Airs of the Sky, the Water Air. The Oxide of Hydrogen exists in the Liquidity of the Waters over the face of the Earth. The Oxide of Hydrogen exists freely in the Vitalities of Earth, in Fauna, and Flora; Water is at home in the Base, the Acid, and the Salt. And Water, being thus kin to most of the Forms of Earth, and they to Water, and Water having Liquidity as a Mean, Water becomes the best of Solvents, or will dissolve most middle or average forms, the Liquid, the Solid, and the Gaseous, Water refusing to dissolve or incorporate only with the thinnest Gases, only the denser and harder Solids.

Water, therefore, being very Heat capacious, and at the same time very cosmopolitan, is a most beauteous and ever-changing Spectacle throughout Nature. Water can assume more changing and more universal Allotropies than any other natural Matter singly, and Water displays itself to our delighted eyes as Rainbow-tinged Clouds, as the Raindrops, and Snowflakes, and Mists, as the Hoarfrost, and Icicles, as the Waters under the Earth, and as the Glacier Rocks of the Mountains.

CHAPTER XXV.

THE INFLUENCE OF CHARACTER ON MATTER.

I HAVE argued that there is both in the Laboratory's Heats and in Nature's Heats of dayshine and nightshine, a constant special range and scale of heat, the Decrease or Minus of which is Cooling, and the Increase or Plus in which is Heating. This Range and Scale of heat from top to bottom is called the Earth's Spectral Force, for it belongs to the Earth as specially as her size and shape, and coming either from Art or Nature, it is never applied in vain to Earth-matter, either in Workshops or in Nature herself. And it is this Range and Scale of heat, that as the Spectral Force of dayshine and nightshine, acts in Nature herself as an analogous heat Range and Scale acts in Art; and by it in Nature herself we see produced Forms analogous to those that Art can make with its Range and Scale of heat in the Workshop; we see Matter in Nature herself Solidified, Liquefied, Gasified, etc., around us, like those in Art's workshops. And these Forms, therefore, are not Inherent to matter; that is, no Matter so exists formed in Nature by birthright, otherwise Matter would never change or act chemically. But Matter is so shaped and dyed in Nature because a Range and Scale of cosmical natural heat analogous to that of Art, has produced in Matter all the Quintessential Forms and Dyes of Nature, through a certain Range and Scale of character in matter.

The Oxygen Air or Steam we breathe from Nature's skies is made by Cosmical Heat in Oxygen, as common Steam is made by Local Heat in Art. And as common Steam while form or state changing heats our Dwellings of Stone, so the Oxygen Steam we breathe while form or state changing within us, heats our Dwellings of Flesh, or our Bodies. The Oxygen is a source or store or magazine of Cosmical Heat, as Steam is a source or store or magazine of Local Heat.

Carbon is made very solid in Nature by Cosmical Cold, as common Ice is made solid in Art by Local Cold. And as common Ice is a source of Local Cold while form or state changing, so is the form changing Carbon a source of the Cosmical Cold. The difference between the Local and the Cosmical Range and Scale of heat is not a difference in Essentials but a difference of Stability. The Local Heat or Cold is preeminently Unstable. The Cosmical Heat or Cold is preeminently Stable; and this difference has served to mask the identity of the two Heats or Colds. For the Local Heat or Cold acts on Small matter, and for Small time, and with great Partialities and Irregularities. The Cosmical Heat or Cold acts for all Matter and for all time, and with the greatest of Impartialities and Regularity. The Cosmical Heat or Cold is the same to-day, yesterday, and to-morrow, and it is uniformly Large enough for all, and uniformly Free to all. And the Matter of this Earth takes this Cosmical Heat or Cold, as it can, that is, by choice or solely by a special Character in

Matter. Man has a special Character, Carbon has a special Character, and Oxygen has a special Character. From the bounteous, free, constant, uniform, perennial, Cosmical Range and Scale of heat, or from the Cosmical Heat and Cold, or from the Earth's Shapecraft's Spectral Force, Man, Carbon, Oxygen, are bound by Character to take or choose each only his Share of heat and cold, each his own Pitches of the Shapecraft's Spectral Force and None others. And as long as Man, Carbon, Oxygen keep True to Choice or Character, and as long as the Cosmical Range and Scale of heat or the Shapecraft's Spectral Force keep True to Character, the great Cosmical Heat that is latent in Gaseous Oxygen and the Cosmical Cold latent in Persolid Carbon are doubly latent or are unobtrusive and stable. The Heat that is in Oxygen will not burn man; the very great Cold that is in Carbon will not frostbite man, because this Heat, this Cold, is present in the World's Shapecraft, in the Earth's Range and Scale of heat for man as well as for Oxygen and Carbon, and as man's Character cannot withdraw or radiate this Heat or Cold directly from the Shapecraft's Range and Scale of heat; so man cannot *readily* withdraw the Heat or Cold indirectly or second-hand from Oxygen or Carbon themselves.

And if the Shapecraft's Heat and Cold were quite unmodifyable or unchangeable, and if Matter's Character were also unmodifiable or unchangeable, we would have on Earth no Active chemistries. But this is far from being the case, Heat or Cold can be modified by us, but always for Small matter and for Small time; and Matter's Character can also be empirically modified by us, and more stably. Hence, even the Cosmical Force and Form of matter, though our Stablest force and form, are not always Stable, but are liable to be modified or seemingly changed by Chemistry, that is, by Fire and Character Modifications, or by Chemical Actions.

And a certain Violence and Abruptness are always apparent and even necessary in the acts of Chemistry, for she acts more or less against the averagely-established Order of the Forces, Forms, and Characters of the World.

The Character of matters, therefore, and its Modifications deserve the Best Thoughts of the Best Theorist of Chemistry, fully as much as the Dayshine and Nightshine; and I adduce the Necessity of, at least, beginning this Great Subject as an apology for my undertaking it, and its Difficulties as the excuse of its most imperfect, rudimentary handling on my part.

The Chief attributes of the Chemical character of matter are the Radiation, the Capacity, the Plasticity, the Conduction of matter.

The Dayshine's and Nightshine's effects on matter, are communicated to matter greatly by its Radiation. And we consider Radiation in matter for those Cosmical shines to be similar to the Radiation in matter for the analogous artificial Local shines. And the Cosmical Radiations in matter, therefore, are determined by the valuable radiation experiments of Tyndall, Melloni, and others; and also by matter's Spectral Lines; both means, the rougher total Radiation, and the more refined Spectral Lines Radiation, being used as a complement and check for each other. The Dark heat of the Laboratory corresponding to the Low pitched Spectral Lines, or refrangibilities, those near, in, and beyond, the Ultra-red Clefs; so that an Element that radiates chiefly those Lines, radiates the Darker intrinsically Colder Spectral Force, and takes, therefore, their cognate Forms and Form pitches of Solidity or of Solidifiability. And an Element that radiates chiefly the High pitched Spectral Lines, or refrangibilities, those near, in, and beyond the Violet clef, radiates the intrinsically Brightest and Hottest Spectral Force, and takes their cognate Forms or Form pitches of Gaseity or Gasifiabilities. Certain Attributes, moreover, such as Lustre in matter, indicate in the possessor a relatively Higher pitched Radiation or a lesser Dark Radiation. We must note, also, that the Spectral Lines of elements that radiate very High, as Hydrogen, or very Low, as Carbon, may appear much fewer than reality, for the Spectral Lines of such elements fall most in the Uppermost, or Lowermost, or in the Unobtrusive Clefs of the Spectrum or of Spectral Force. The local Spectra of Nitrogen and Oxygen are very extensive and must be so, for they are, indeed, together the counterpart or backbone of what is called the Solar Spectrum itself.

We must remember, also, that Radiation, specially as indicated by Spectral Lines, is influenced remarkably by Temperature. With change of Temperature the Spectra change from those of the First to those of the Second Order of Spectra; and we, therefore, assume that this happens to radiation not only with the common or Local temperature, but with the Cosmical Heat or Cold that elements and chemicals represent to each other when juxtaposed for chemical Actions.

The Thermal, or the heat and cold Capacity in the elements is correlated to their Equivalent Numbers of substitution, those numbers, namely, that are independent of any Theory. If a pound of Mercury at 20° be shaken up with a pound of Water at 54°, the temperature of the shaken Mixture is 53°. The Water loses 1°, and the Mercury gains 33°. To heat Equal weights of Water and Mercury in Equal times requires more heat for Water than Mercury. Water and Mercury, therefore, behave with Heat differently; they have different Capacities for heat; and, indeed, each represents a type of Capacity. Mercury is type of the heatable Capacity, and Water of the prolific or storing Capacity. The Heatable capacity is indicated *directly* by the Equivalent numbers. And Mercury having 200 as its Equivalent, has this Type of capacity in high degree. The Prolific capacity is indicated *inversely* by the Equivalent numbers; and Water having only 9 as its Equivalent, has for a compound the highest of the Storing or Prolific capacity. The Heatable capacity is often accompanied in matter by a Higher pitch of Form, by nearer Ascending state change points. The great Characteristic of the Storing Capacity or of the Small Equivalents in matter is Chemical Form Power, or Prolificness. The Group of elements that has the Smallest Equivalents of substitution Numbers, the Organic Elements, Carbon (3), Hydrogen (1), Nitrogen (4·7), Oxygen (8), has also the most Form Power in Chemistry. You heat any of the Organic Elements, those bodies with the smallest equivalents of substitution numbers, and much of this Heat disappears in them as Thermometric Heat, but is not thereby lost, but is, as it were, stored up, and can become *Form Power* in those very prolific Elements. Moreover, Capacity exists for Heat and Cold, and is modified by local temperature, often in a remarkable degree; and if this happens with Local Heat or Cold, I assume that it will also happen with the Cosmical Temperature, or with the Heat and Cold that Chemicals molecularly juxtaposed for chemical Actions, afford to each other.

To conduct Heat or Cold or the Spectral Force, the heated or the cooled matter must be in touch, mediately or immediately with others. Conduction, therefore, serves in its possessor mostly for the acquisition of the Spectral Force or Heat and Cold not from the Sun and Stars, but from fellow Earth-matter. And since mean Earth-matter is Planetary, its Heat is so also, or belongs to the Lower pitches of Spectral Force, or is comparative Cold and Shade. Conductives, therefore, have usually the contracted or contractable, the solid or the solidifiable Form or Form pitch. A conductive even if much heatable by the Sidereal shine powers, and thereby Gaseous, as is Hydrogen, will be able, in favouring circumstances, to cool by conducting the Earth's Morphigenic Cold Force to itself; and the conductive chemical, though Sun heated, has therefore the Wherewithal to become readily Earth Cold. Conduction for the Cosmical Heat and Cold is the same as the Electric conduction, which itself does not much differ from the conduction for the Local Heat and Cold. Moreover, conduction is equal for Heat and Cold, and is also modified by Temperature, certainly by Local, presumably also by Cosmical, temperature.

The *Cosmical* heat and cold Plasticity, the *Cosmical* Dilatation by heat and the contraction by cold, is inferred to exist, if the *Local* exist; and the proportion of the *Local* plasticity is pretty much the same as that of the *Cosmical*. And the Plasticity of matter is also modifiable certainly by Local, and also presumably by the Cosmical, Temperatures which juxtaposed chemicals afford to each other during chemical Action.

And because the Quintessential Form and Form pitch in matter depends more on the Photothermal attributes of chemical Character than on its Weight attribute or its Gravity, the local Attraction in matter is not referred to *Gravity* at all, but is called *Cohesion*, an Occult Force which *we* find depending much on the total chemical Character of matter, cosmical weight included.

The Photothermal Character of matter, therefore, consists of Capacity, Radiation, Conduction, Plasticity, *each distinctly modifiable both by* COSMICAL and by LOCAL *Heat or Cold.* You improve Capacity, Plasticity, Radiation in matter by simply heating it with *Local* Heat, and *vice versâ*, and you do the same if you heat matter with the *Cosmical* Heat. You deteriorate Conduction in matter by simply heating it in Local Heat, and *vice versâ*, and you will do the same if you heat matter with the Cosmical Heat that molecularly juxtaposed Chemicals afford to each other during Action and Combination.

We have argued that Carbon is very cosmically or stably cooled, and that Oxygen is very cosmically or stably heated. Carbon is Cosmical *Cold*, Oxygen Cosmical *Heat*. Touch Carbon molecularly with Oxygen and Oxygen with Carbon, and then you shall have this Heat of oxygen increasing the Capacity, the Plasticity, the Radiation, and decreasing the Conduction of carbon. Oxygen's heat, therefore, is inducting on Carbon, a character that will enable Carbon to gasify by Oxygen's and by the Shapecraft's Forces. And on the other hand the Cold of carbon decreasing Oxygen's Capacity, Plasticity, Radiation, and increasing its Conduction, prepares Oxygen to be condensed by Carbon's and by the Shapecraft's Forces; and the two characters therefore reciprocally induct a mean Character on each other that enables the two Elements to be meanly shaped by the Forces of themselves and of the Shapecraft, or to combine into Carbonic acid Gas, where Carbon is gasified, and the almost unliquefiable Oxygen is condensed into the brink of Liquefaction or Liquidity, or much reduced in its Form pitch.

The Elements that are heaviest are metallic, and Heaviness tends to make the heavy matter into Solid matter, and, indeed, into Persolid matter; since Plus gravity by drawing matter strongly to Local Centres ought to make matter contracted or Solid, or even infusibly solid. But Metals generally have the larger Equivalents, and therefore the greater heatable Capacity; the Metals have lustre, which is tantamount to bad Dark radiation and relative good Bright radiation; and the Metals, the softer they are, cosmically conduct the worse. Hence a Metal, if it be very brilliant, if it radiate in high pitches, if it be very soft, if it have a large Equivalent, if it be locally heat dilatable, may be Fluid in spite of Heaviness, for such a Metal is a bad conductor, a bad Dark radiator, a relative good Bright radiator, Good at being heated and dilated; and Mercury is the best Type of such metals, which, however, abounds in Chemistry. The only Solidifying attribute in Mercury is considerable Heaviness, but that heaviness or weight suffices only to give the perfect Globularity to Mercury's liquid Form, while the intense and stable brilliancy of Mercury or its bad Dark radiation, its Softness, or its bad conduction, its large Equivalent, or its great heatable Capacities, its high-pitched Spectral Lines, its local thermal Dilatability explain why the Cosmical Spectral Force in Dayshine and Nightshine has the melting power over heavy Mercury's Quintessential Form. Good heatable Capacity or the larger Equivalents, relative good Bright radiation or Lustre, good Local heat Dilatability, with bad Dark radiation, and lesser Conduction or greater softness in Elements, explain in them, I submit, the dilated and the Natural dilatable Quintessential Form, the Plus, the Positive, or the Sidereal natural Morphigenic Heat Force in them.

In the Class of Alkaline Metals, it is the heaviest of them (Rubidium) that takes from the Shapecraft the most positive Form pitch; for the Solidity pitch in Rubidium melts at 38 degrees and boils at Red heat. For Rubidium has the largest Equivalent or the best heatable Capacity of the Alkaline Metals. Rubidium has the Blue vapour and the blue Spectral Lines in radiation, or has the best Radiation. Rubidium has the greatest Softness or the worst cosmical Conduction, and is also seen to dilate best with Local Heat. Rubidium behaves analogously in Nature, and is the most Thermally dilatable of the Alkaline Metals.

If we classify the Alkaline Metals according to the greatness of their Equivalents, that is, their heatable Capacity, and according to their Radiation and Conduction pitch, we find that Lithium has the worst heatable Capacity, or the lowest Equivalent, and Lithium has also the worst or the Orange Radiation, and Lithium is also the Hardest or is the best Cosmical Conductor. Lithium, therefore, though the lightest, has the least expanded or expansible Quintessential Form, or melts and boils the worst of the Alkaline Metals. Next follows Sodium, which has the next Equivalent and radiates remarkably in the Yellows or Middle pitches of Spectral Force, etc., and Sodium has the next form in Positiveness. Next follows Potassium, and lastly comes Rubidium. In the same manner we find that Iodine, though rather heavy, because it has a large Equivalent and the great heatable Capacity, because it has quasimetallic

Lustre and very bad Dark radiation and conduction has a highly Positive pitch in natural Solidity.

The weights are so different in the Halogens, or between Chlorine, Bromine, and Iodine, and the Conduction and Dark radiation are so uniformly bad throughout the group, and the High-pitched radiation so uniform among them that the weight tells in the Forms of the Halogens more than the weight can do in the Alkaline Metallic Forms, and the Halogenic heatable Capacity or Equivalents tells in their Form also relatively less than the Alkaline Metallic Capacity influences Form.

Heaviness viewed as a Matter Shaper, or in Chemistry, limits the Form in the heavy to the low or to the bass-like Clef of Forms, that is, to the lower pitched Solidities, or Liquidities, or Gaseities. And the bass-like Clef of Form, like the bass Clef of Voices or of Music, is generally less flexible than the upper Clefs. The most complex Music is not written for the Bass, but for the Upper clefs. In Chemistry the complex Forms are not given to the heavy Elements, but to the light and lightest, to Carbon and Hydrogen, Nitrogen and Oxygen. Heaviness, therefore, so far hampers Formations and Transformations in Matter, that the heavy Elements are often Chemically inactive, and are always comparatively Oligomorphic. But by having often large Equivalents or large heatable Capacities, by having relative and actual High radiation and bad Dark radiation, the heavy Elements may escape completely Monomorphism, and may transform or act Chemically with difficulty, and always into fewer humbler Forms.

Oxygen and Nitrogen conduct badly, and are bad Dark radiators, are light and plastic, and both radiate the

Highest pitches of the Spectral Force of Dayshin
Nightshine. The Plus Pressures and the Minus Sp
Force, the Cosmical Cold and Shade, the contr
Form solidifying powers, are greatly excluded
Nitrogen and Oxygen, while the Minus Pressures, a
Plus pitches of the Day's and Night's fires, are c
trated upon them. And consequently Nitroge
Oxygen are expanded and cosmically heated, and
into a violet-blue glowing Gaseity, and overcano
much colder peripheral Earth-globe, as an Atmos
Ocean shell, just as furred Animals keep life-warmt
in the deadly colds of the depths of Polar winters.

Free Oxygen, therefore, is kept in the sky,
Chemistry from the darker Earth-shines and Plu
sure, Oxygen is kept from Plus pressings, and from
Oxygen is kept from form Condensations, Liquefa
Solidifications, by Free Oxygen's lightness, bad c
tion, bad dark radiation, bad heatable, or c
capacity. And, if this be true, you may conden
liquefy, and even solidify Oxygen, in the proport
which you can give Oxygen more cold conduction
dark radiation, more weight, more heatable or c
capacity, and less of the heat dilatability; or
proportion in which you can modify Oxygen's ch
in certain directions. Now we know that the att
of character are modifiable in matter by local H
Cold, by Plus or Minus Pressures, or by their co
Analogues present in the Morphigenic Thermal
of matter, or in the natural expansions or contr
in which the Elements exist naturally. Conseq
when you molecularly juxtapose suitable metal
Oxygen, the Metals bring to the juxtaposed
an inductive or character-modifying Power, that

possible an Oxymetallic character blending or partnership; the Metals furnishing to Oxygen always cold conduction, and often weight, together with increased heatable or coolable capacity, and lessened heat dilatability, or a relative cold contractility. In other words, the suitable Metals improve in Oxygen the attributes by which the Cosmical Cold and Plus Pressure or both, can act more preponderatingly on Oxygen. And as the Cosmical Cold or Low pitched Spectral Force and Plus Pressures exist ever active on Earth's Shapecraft, they do act more strongly on that Oxygen character blended with the metal, and liquefy or solidify the Oxygen and the Metal, and keep them, as Oxymetallic Matter, so contracted; making out of the blended character a blended Allotropic Form, or, as is said, making Oxygen combine with the Metal; making out of the Oxygeno-Metallic Character an Oxygeno-Metallic Form, or what is called a Metallic Oxide.

CHAPTER XXVI.

THE CHARACTER AND FORM OF CARBON.

CARBON has remarkably the eight attributes by which Brightness and Darkness, Colour and Blackness, Heat and Cold, and the Correlated Expansions and Contractions of the Quintessential Form are communicable to Matter. Carbon is very storingly capacious, equally for Cold and Heat (3). That Carbon can be highly dilated on Earth is seen in its gaseous compounds with Hydrogen and Oxygen—namely, in Marsh Gas and in Carbonic Oxide. And that Carbon can be brilliantly coloured, is seen in Flora; and that Carbon can be much contracted and blackened, is seen in the insoluble, infusible, hard, black, solidity of the Brazilian *carbonate*. Carbon radiates or absorbs the Higher and the Lowest pitches of Spectral Force, the darkest and the brighter shines in the Dayshine and Nightshines. Carbon's multi-radiancy is established by Melloni, and also, I submit, by its electric light, by its lightening effects on many flames, by its behaviour throughout Chemistry; and lastly Carbon conducts fairly Heat and Cold, and is neither heavy nor very light. It results from this remarkable chemical Character that Carbon can appropriate readily and well either the us or Minus Pressures, either the High or the Low tches of Spectral Force, with their correlated expan- ons and contractions, Plus and Minus Forms and olours, according to the preponderance of Cosmical Heat nd Cold, or of the High or Low pitched Spectral Force r Carbon.

When Cosmical Cold or the Lower pitches of Spectral orce preponderate for Carbon, then by Carbon's con- uctivity and good dark radiation, Cold will rapidly enter nd permeate Carbon, and will occupy its Atomies in olecules, according to their great Cold capacity, and he cold will further contract the Atomies, according to heir perfect Cold plasticity. And consequently Carbon's uintessential Form will become Cosmically cooled, con- racted, hardened into a black solidity, the most perfect n Chemistry.

But if Cosmical Heat or the Higher pitches of the Spectral Force of the Dayshine and the Nightshine pre- onderate for Carbon, then by Carbon's conduction and right, high-pitched radiation, Heat will rapidly enter nd permeate Carbon, and will occupy its Atomies in olecules, according to their great heat capacity, and the Heat will further expand the Atomies in molecules, according to their great expansibility; and Carbon will become throughout a Highly cosmically-heated or expanded, softened and coloured, Chemical.

On free Carbon's Quintessential Form cosmical Cold or the Lower pitches of the Dayshine's and Nightshine's cosmical Spectral Force, and the Plus Pressure preponderate. For free Carbon conducts and radiates Cosmical Cold, and is heavyish, and is cold, capacious, and contractible, and is integral with the Earth, in which Planetary minus Heat or a Cosmical Cold preponderates.

Free Carbon, therefore, is in a *Threefold* way subjected to the contracting, solidifying force of the Shapecraft. And only by its Great, bright radiation is Carbon subjected to the Plus Heat of the sidereal force or to the form Expander of the Shapecraft. The attributes that bring to Carbon's Form Contraction Force, being threefold, and the attribute that might bring to Carbon Expansion Force, being onefold, the *Threefold* Contraction Force of the Shapecraft or the Cosmical Cold and Pressure must preponderate in Carbon's form. In other words, free Carbon subjected to the Shapecraft's darkest dayshine, or lowest Spectral Force, or keenest Cosmical Cold, is at the same time also subjected to Carbon's self Gravity unopposed by Plus Heat; and Carbon's Form is, therefore, both pressed and cooled exceedingly, and consequently allotropizes into a very hard, black, infusible, and insoluble solidity.

Consequently Carbon's Form is kept, when free, most perfectly from the Minus Pressures and from the Higher pitches of the Dayshine and Nightshine force, or of the Spectral Force. That is, Carbon, as long as it is free, is kept from the expanding, liquefying, gasifying, and dyeing Forces in Nature and in Art, by Carbon's medium weight, its cold conduction, its exhaustive radiation of the very darkest or lowest Spectral pitches of Force, and its great Cold capacity and contractility. And if this be true, you will expand, liquefy, gasify, and dye very capacious and dilatable and not over heavy Carbon, in the proportion in which you can give it more Lightness, less Cold conduction, and less dark Radiation, while retaining sufficient of Carbon's plasticity. And this you do when you combine or molecularly juxtapose or surround Carbon's Atomies with plenty of those of Oxygen. For Oxygen's

Character juxtaposed to Carbon will bring its inductive influences upon Carbon's Character, or the Two Characters influence each other so as to produce the blending mean of Character between them, by which they can be fused into one Character, into one achorded or harmonious Pulsation, or into an Allotropy, or into One seeming matter. Oxygen will bring into the Carbon combination, or into the Character blending, or into the partnership, into the form pulse chord, bad Dark radiation, bad Cold Conduction, Lightness, while retaining High dilatability.

Consequently Oxygen improves in its partner Carbon the attributes by which Dark heat or Cold and the Plus pressures are greatly excluded from Carbon, and furnish the attributes by which the Higher Spectral Force and the Minus pressures can act more preponderatingly and stably on Carbon. And as the High Spectral Forces exist in the Dayshine and Nightshine and the Minus pressures exist also in the Shapecraft, through Oxygen, they do act more strongly on that Carbon surrounded by Oxygen, and make these two elements combine into Carbonic Acid, or Carbonic Oxide, gases.

Free Carbon has a most noteworthy insoluble, infusible, hard, black solidity, or free Carbon is the most persolid of the Elements. In free Carbon's Atomies in molecules there exists, therefore, an intense Local, Centripetal Force, or Attraction, or Cohesion that makes them the most shrunken and contracted and impenetrable or hard and infusible Matter Allotropy in Chemistry. This Centripetal Force we take to be the medium Local Gravity of the heavyish Carbon, acting with an advantage in Carbon, because acting coincidently with Cold on homogeneous Matter, acting in the absence, therefore, of the antagonism of that Centrifugal force or motion in matter, called Plus Heat. Acting greatly unopposed, the medium local gravity is in Homogeneous Carbon intensified into a supreme gravity, and draws the homogeneous matter of a Carbon particle to the particle's own Centre, and in an ultimate Cluster of particles draws the individual particles themselves so strongly around Cluster Centres of gravity that the Particles and Clusters cohere into the hardest and most infusible allotropies of solidities; so that even the Ethereal movements of Light thread their way amid the Carbonic contracted Particles and Pores with difficulty; and Light is in the Diamond refracted greatly and is farther reflected, twisted and thrown off, in the corruscating Sparkles of that Gem. A cohesive contraction in Carbon that the molecular Dilating force of the plus heat, even of the Oxyhydrogenous flame, cannot undo; for even in this hot flame the Heat Pitch that multiradiant free Carbon easily acquires from the flame, the Earth takes or cools in Carbon, by the most perfect terro-carbonic reciprocal radiations; as may be observed in the great brightness of many carboniferous flames. As long, therefore, as Carbon has this reciprocal terro-carbonic conduction and radiation, in other words, as long as Carbon is *free*, Carbon cannot be melted. But the moment you greatly stop these terro-carbonic photothermal sympathies of Carbon, the moment you surround Carbon with Oxygen or Sulphur, that have not the Planetary but the Sidereal sympathies or Characters, then you are at once able to melt and even to gasify Carbon, or to combine it into its liquid allotropy of the Bisulphide of Carbon or of gaseous Carbonic acid.

CHAPTER XXVII.

CHARACTER AND FORMS OF CARBON.

Assuredly on this Earth there is both Heat and Cold, both Light and Shade. We and all other animals perceive them, and not we or animals alone, but all the chemicals of the Peripheral Earth with Flora and Fauna, as a unified Earthly Family, perceive them together. And, in truth, some Animals, some Plants, some Minerals perceive the natural, Cosmical Heat and Cold, Light and Shade, far more acutely than we ourselves do, because such Bodies may have the more befitting capacity, conduction, radiation, plasticity for the Natural, the Cosmical Heat or Cold, Light or Shade on Earth. Assuredly also there be few that do not early, feelingly know the effects of clothing or nakedness on the Animal Heat or Warmth. But clothing or nakedness means good or bad Thermal radiation or conduction in the clothed or naked; in its radiation and conduction, and not on the Sartoreal attributes of dress or undress, depend its Powers of keeping us warm or cold. Consequently, as Carbon conducts Cold, radiates or absorbs exhaustively traces of Cold into the amplest Cold capacity and contractility, and Sulphur-clothed, Carbon will keep warmed by the higher Pitches of the Spectral Forces of the Dayshine and Nightshine, which Carbon is good at radiating and appropriating, and which when free or naked or unsulphured or unfurred or conducting and dark radiating, Carbon cannot keep from the Planetary Cosmical Cold and Shade of the Earth's Shapecraft and Dyecraft. Carbon, however, clothed in a full Sulphur fur suit, Carbon as Sulphocarbonaceous matter, Carbon combined with Sulphur, keeps the high Spectral Force or the intrinsically intensest Dayshine and Nightshine Heat that Carbon radiates well, into the amplest capacity and plasticity, and Carbon is thereby so warmed, that Carbon, if well Sulphured, is melted into a Volatile Liquid, in its part of Bisulphide of Carbon, and keeps stably so, by the uniform Cosmical Shapecraft and Dyecraft of the Earth. .

Carbon has the intensest of storing capacities and plasticities for Colds, and Carbon conducts and radiates Colds; Carbon, however, has also as intense a storing capacity and plasticity for Heats, and conducts and radiates Heats also; and Carbon is far from heavy. Consequently we see Carbon in Cosmical Chemistry, in both extremes of Forces, Forms, and Colours; we see Carbon as Coal, or *Carbonate,* a Hard, Cold, and Black Solid; or we see Carbon very bright and heated in its many organic compounds; or according as Carbon is delivered up to the preponderance of Earth's Forces which are Planetary and Dark and Cold; or to the Sidereal Forces which are Sun's Heat and coloured Brightness. If you shut off from Carbon the preponderance of Earth's Forces by making it a partner of bad Cold Conduction and bad Cold Radiation, you at once relatively increase on Carbon, the Sidereal Forces, or the a Leyden Jar, however highly plus-charged, no Plus or Minus Electricity is obtrusively apparent; you would not at a glance know that the Jar was charged with any Electricity at all: in like manner, in the Oxygen of the Sky around us, no Plus-charge of Dayshine or of Light and Heat are obtrusively apparent, and no negative charge in the Earth is obtrusively apparent. You must establish communication between the Negative and Positive Surfaces of the plus-charged Jar before you can develop between them those oscillations in the Ether and Ethero Molecules of the Discharging Rod, and those Zigzags or Oscillations in the Ether and Ethero Molecules of the intervening Air, that show that there is really one *Plus* half of the electric shine power or Spectral Force in the Positive Surface of the Jar, and the other *Minus* half of the electric shine power or Spectral Force in the Negative Surface of the Jar; to get these Zigzags or Oscillations between the Plus and Minus you discharge the Jar with the Discharging Rod, which may be made of any Conductor. It is analogous with the Sky Oxygen; to show that Oxygen is really charged with Dayshine and Nightshine above its fellows, to show that there is really the *Plus* half of the Electric or the Spectral Shine power in the gaseous Oxygen of the Air ocean, and the *Minus* half of the Electric or Spectral Shine power in the solid surface of the Earth, you must establish Conduction and Radiation between them, or you must discharge them into each other with a virtual Discharging Rod. Oxygen is itself ozonifiable, or can become easily 'dark ; radiant, for although Oxygen is a Gaseous sky element, Oxygen is also, and in a still more abounding degree, a Solid land constituent; the low or Dark Radiation, the low or Dark Form, is easily induced on Oxygen, specially in company with a suitable Metal. If you molecularly touch Oxygen with a light, fusible, volatile Conducting Metal, you give to the Oxygen that tends to Dark radiation Earthwards conduction or facility for the inductions of the Dark radiation, and thereby between the Metal with Oxygen and the solider Earth there is Conduction and Radiation or the virtual Discharging Rod, and then there passes between the Oxymetal and the Earth those oscillations of Plus and Minus Forces and Forms that produce the Electric or Combustion Spark, and the Metal with Oxygen are said to burn.

By means of intermediary, positive, conducting Metals the Force and Form and Character of the Oxygen, on the one hand, and of the Mean earth on the other, can by mutual inductions be approximated towards the blending, and can, therefore, oscillate into exchanges with each other. Oxygen's Force and Form and Character, touched molecularly with those of Positive Metals, can oscillate into exchange with those of the Mean earth, and *vice versâ* on the Earth's part; in other words, there is then the Discharging rod between the Oxymetal and the mean Earth. The Oxygen sinks in Force, in Form, in Character the most, or discharges Plus or most of Dayshine powers, the Metal less, to the profit of the Mean earth; and the Mean earth rises in Force, in Form, in Character at the expense of the Oxygen and Metal, or discharges the Minus Day Shine Powers. The action is only Oscillatory; what is gained by one set of oscillations is lost by the other; what is lost on one side is gained on the other.

CHAPTER XXIX.

THE CLASSIFICATION OF THE CHEMICAL ELEMENTS—THE NEGATIVES.

Two Forces in Polarity exist in the Quintessential Shapecraft of the Earth-globe, namely, the Sidereal and the Planetary Forces—a Form-expanding and a Form-contracting Power. And these two Forces may be called the Contracting the Negative, and the Expanding the Positive Force, after the Electric Forces with which these Forces themselves are in essentials identical.

The preponderance, through Chemical Character, of the action of either of these sets of Forces, the Negative and the Positive, has moulded the forms of the Chemical Elements into two groups, corresponding to the two sets of Forces themselves—namely, into a Force Negative Group of Elements, and into a Force Positive Group.

Contraction and contractiveness in an Element is the central essential characteristic of Force Negativeness in that Element. And Solidity being the form of most contraction in Matter is the first sign of Force Negativeness in an Element. If an Element be solid, it is *ipso facto* on the Negative side of the Elements. And the more infusible and dense or hard the Solidity, the stronger its

Force Negativeness, because such Solidities have the smallest expansions and expansibilities, and relatively the most contraction.

The contracted, or hard, or dense, or infusible Pitch of Solidity is the greatest sign of Force Negativeness. But even the Potential Solidity, or the ready Solidifiability or Contractility, will indicate Force Negativeness in an Element. The Potentials of ready Form contractility or solidifiability are given to the Elements greatly by Conductivity for Heat and Cold, or by Radiation for the lower pitches of Spectral Force. If an Element have heat and cold Conduction, and good cold Capacity and Contractility, then that Element, even if it be Gaseous or very Un-negative, may yet become Negative, by conducting to itself the Minus heat and light, or the Planetary cold and shade of its integral Mean earth, and with the Earth Cold, conducting also the associated Forms of contraction, or Solidities, or of Force Negativeness.

We have, therefore, the contracted pitches of Solidity as the sign of the first-class Force Negativeness in the Elements. But, in addition, we have heat and cold Conduction and cold Contractility, and the acquisition of the Darker radiation in Elements, whatever be their Forms, representing to us the very important Potential Force Negativeness in the conducting and dark radiating Elements. Hence all Metals, including even the gaseous Hydrogen, are in the Negative Class—that is, they all have at least Contractiveness or ready Contractility by conduction, and most Metals have also the actual Contraction or Solidity itself. Moreover, even Oxygen itself, by being ozonifiable, or by becoming easily Ozone, or very Dark radiant, makes an unstable Negative to its Nitrogenous or Halogenous compounds.

Molecular gravity (cohesion) in extreme. And both these Forces, and in such Extremes, act on the Atomies in Molecules in Carbon; but Cosmical Cold acts first, and greatly kills in Carbon the Plus heat, or that Force or Motion that is the chief Antagonist to the local Medium gravity or cohesion of Carbon, and then the Medium gravity, acting unopposed, in cold homogeneous Carbon, becomes Supreme gravity or cohesion. And the Extreme cosmical cold and the Extreme local gravities between them contract Carbon into very Extreme Force Negativeness or into a *Light* Persolidity—in fact, the greatest and the best Force Negativeness for chemical Actions and Combinations, or for the Chemicalization of matter. In other words, molecular Form and Colour pulses in free light Carbon are abeyant or much slowed, but not hopelessly extinguished or impossibilitated. Light Carbon is very hard and contracted, or very Force Negative, or is cosmically Plus cold—not chiefly because it is Plus heavy, but because Carbon conducts and radiates, or absorbs greedily, or into the amplest storing Capacity, the plus or the deepest Cold and Shade in the Dayshine's and Nightshine's Spectral Force, or in the Shapecraft; and then Carbon can be simultaneously farther much contracted by Carbon's local gravities or weight; because Carbon's gravity, though itself but small, has all its own way, or becomes supreme, when helped by great or most Plus cosmical cold. Consequently this Force Negativeness in Carbon can be undone or modified in the proportion in which you can change Carbon's good cold conduction into a worse, Carbon's supreme cold or dark Radiation into greater and greater heat or bright Radiation. And this change is easy to make in Carbon, because it is already multiradiant, and not too heavy; and, although we can never fuse Carbon when single, or when cold conducting and dark radiating Earthwards at its best, we easily fuse or thaw light Carbon, and even parboil it or gasify it intensely, when Carbon is molecularly surrounded with bad conducting and generally bad dark radiating Oxygen, or even with the very badly conducting Sulphur. For the blending equilibration of Characters between Sulphur or Oxygen and Carbon modifies Carbon's dark radiation and cold conduction; that is, shunts light Carbon from the cold, form-contracting lines of the Shapecraft into its hot, form-expanding lines; and Carbon conducting and radiating somewhat like Oxygen, or combined with Oxygen, is at once gasified into Carbonic acid by the Shapecraft; and conducting and radiating somewhat like Sulphur, or combined with Sulphur, Carbon is at once liquefied into the Bisulphide of Carbon by the very same Shapecraft; for there is nothing in the rest of Carbon's character that can prevent this shunting change in Carbon.

But an Element, though not Solid, nay, though highly Gaseous, may still have Contractiveness in its Character, or can still act the part in chemical Actions and Combinations of a Force Negative or of a highly form-contracting Element, provided the Element possess some Conductivity or some Dark radiating power, or the means of readily exchanging cosmical Heat, for cosmical Cold, Expansion or Gaseity, for Contraction or that Solidity which is correlated to the mean of the Terrestrial Morphigenic Cold Forces or to the Mean earth.

If an Element can conduct or radiate the Cosmical Heat towards the Mean earth, and the Cosmical Cold from the Mean earth towards itself, then that Element, however gaseous or expanded or Cosmically heated it may be, can be assimilated to the Mean of terrestrial Morphigenic Cold Forces, or can become proportionally contracted, cooled, or solidified. We observe, therefore, that all the Metals, and specially the positive Metals, and even the most positive of Metals, Hydrogen, have all this conduction-depending contractiveness; for Metals, acting directly chemically with Metalloids, such as gaseous Oxygen, become Force Negatives, that is, form Coolers, Contractors, and Solidifiers to the Oxides or to the Compounds that result. And if the positive Metal be gaseous, as is Hydrogen, it cools, contracts, or liquefies into the easily icifiable Water, with its metalloidal partner, the gaseous Oxygen in equilibration with the planetary Cold and Shade of the Mean earth. And if the Metal be liquid, like Quicksilver, it contracts or solidifies with its originally gaseous metalloidal partner, Oxygen, into the solid Oxide of Quicksilver. And if the Metal be already solid, like Zinc or Calcium, it becomes after Action or Oxidation or Burning with its gaseous Partner, the Metalloidal Oxygen, still more solid or persolid, that is, more infusible in the Oxide of Zinc or in Lime.

Again, an Element like Oxygen that becomes easily dark radiant, as in Ozone, though usually bright radiant, has also the power of becoming Negative to certain partners in Action with it; as seen in the compounds of Nitrogen and the Halogens with Oxygen; but these Oxynitrogenous and Oxyhalogenous Compounds are unstable from the Instability of the Oxygen radiation itself. For Oxygen mostly has the positive Character, Force and Form, and Behaviour in chemistry.

Force Negativeness in an Element turns it into a miniature local Mean Earth for the local miniature portions of matter in a Chemical Experiment. And the Force Negatives either actually have the Planetary Forces, Forms, and Characters, or can readily be assimilated to the Planetary Force, Form, and Character of the Mean Earth.

CHAPTER XXX.

THE CLASSIFICATION OF THE ELEMENTS—THE NEGATIVES.

THERE are, therefore, two chief ways in which the elements can become contracted or Force Negative—by Plus Gravity or much Heaviness; by Plus Cold or much Slowing of the form and colour Pulses in the element's Ethero molecular matter; and of these two Force Negativenesses, that produced chiefly by Cold is the most perfect and important, for though it leads to greater Hardness and greater Infusibility in matter, it can be escaped from.

In Carbon, whose Force Negativeness is produced chiefly by Cold, the Atomies and Pores are shrunken to the utmost, the atomical and ethereal Pulses in the pores being reduced to great Slowness and narrow Amplitudes; Carbon, therefore, presents a close compacted array of Atomies and Pores to any intruding force or matter; and Carbon is not only hard to the penetration of other Matter, but even to the penetration of the motion of Light itself; and Carbon, as the Brilliant, and in a Flame, refracts and reflects Light or sparkles more than the Matter around it. Carbon's storing capacity for the photothermal Force is all but the best in Chemistry; it is three, and the storing capacity is inversely as the smallest equivalent of substitution in number. Carbon, therefore, radiating well and conducting from the Morphigenic Thermal Force of the Planetary Earth, and, being heavyish, stores by its great capacity more of the Earth's Planetary photothermal Force and Form than any other Element, and thereby Carbon becomes most perfectly Planetary, or very firmly frozen, very form-contracted and Force Negative. But when Carbon, on the contrary, radiates and conducts from the Sidereal photothermal Forces of the Shapecraft, as Carbon does when in molecular contact with the Organic Gases; then Carbon's storing capacity tells for the Sidereal Heats, as it told for the earth's Planetary Colds, and Carbon, not being over heavy, becomes heatable in many Pitches of the Spectral Force, or in all the Spectral colours of the Rainbow and beyond, as is seen in Flora and Fauna and in Carbonic Oxide and Marsh Gas. And the Organic Gases, therefore, are to Carbon no fabled Prometheus, and actually steal the Fire of Heaven wherewith to rouse into Chemical and Organic Life the Black-Cold Atomies and Pores of Carbon.

Heaviness in matter resists Force or *Molar Motion;* and as Chemical Action is *Molecular Motion*, Heaviness in an Element is not without its negative effect on Chemical Activity, or on the *Molecular Motions*. Heavy Elements are more inactive than they would be if they were light. Lead, with its actual softness and fusibility, would have been another Potassium or Sodium in Activity if Lead had been Light, and more storingly capacious, like Sodium and Potassium; and so would Mercury. Heavy elements, which generally are Metallic solids, act Chemically with difficulty, or are inactive, or are sluggish in moving with the higher and faster Form and Colour Pulsation of their Oxide State. The Oxygen of these Metallic Oxides is excellent at pulsating highly, and these Heavy metals are bad at these Pulsations. When, therefore, you heat the Oxides of such Metals, their Oxygen takes readily the highest of the heat pulses which the sluggish, heavy metals, however, cannot accompany, and therefore fall off, or leave the highly pulsating or heated Oxygen. In other words, the Oxides of the Heavy Metals tend to be reduced by simple Heating.

These sluggish, inactive Metals have been called, and not in covert irony, Noble by Man. But being not Aristomorphic, but most humbly Oligomorphic, these Metals have not as yet earned from Chemistry the Patent of Nobility. The inactivity of Free Carbon, however, differs widely from that of noble Metals. For Carbon's Character there exists on Earth a mighty Force, the Sidereal Fires around the Earth and partly in the Metalloids of the Earth, a mighty Force kept back or balanced by two other mighty Forces on Earth, viz., Gravity and the Minus planetary Fires or the Cosmical Cold on Earth—a mighty Sidereal force ready to expand or heat the Carbons the moment its Antagonists, the Contracting planetary Forces, are eased off from the Carbons. In Carbon, therefore, there is a supreme Activity held bound, a mighty Spring compressed. Carbon is no sluggard, but a Genii charmed or shorn for a time of his powers. And Carbon, although a sooty Cinderella drudge in Man's eyes and keeping, being polymorphic and aristomorphic, is an Essential of the Life Form, and a fairy Princess or a Crowned Head in Chemistry.

Finally, Force Negativeness is indicated in an Element, whatever be its Form, by mere heat and cold Conduction or the darker or planetary Radiations in the Elements, because Contractiveness, or part of the earth's Mean planetary Morphigenic Thermal Forces, or the earth's Negativeness, is attainable during Chemicalization by Conduction and dark Radiation in the Elements.

The Elements, therefore, may be divided, and, indeed, have long been divided, into two great classes.

1st.—The Negative Class, that is the Metals, carbon and the carbonoids or the fair conductors of Local Heat and Cold, which are one with the Cosmical Heat and Cold, which are one with the *Amber Forces* or the Plus and Minus Electricities, which are one with the Terrestrial Compass of the Spectral Force of Dayshine and Nightshine, which is one with the Plus and Minus Quintessential Form compass for matter.

2nd.—The Positive Class, that is the Metalloids, or the worse Conductors of Local Heat and Cold, and its Correlates or Cognates.

Into the Force and Form and Character Classification of the Elements, a third class must, however, be farther admitted, consisting of Hydrogen and Oxygen. These two great Elements act both Positively and Negatively. Hydrogen Minerally, as in the formation of Water, acts perfectly Negatively to Oxygen by Conduction. Hydrogen, however, acting singly with Carbon, and in Organic Chemistry, acts, by the majority of its Character, Positively, Carbon being the chief and the most perfect Negative in Organic Chemistry; and Oxygen acts as the Negative to Nitrogen and the Halogens, but Oxygen generally acts the Positive part in Chemistry; this behaviour of Hydrogen and Oxygen being, however, explicable by their positions and by certain observed attributes and variations in their characters.

Between the Metals, the better conductors of heat and cold—and the Mean of terrestrial Morphigenic Cold Forces or the Mean planetary earth, there is always, at least, *possibility* of rapid conduction or exchange of Heat or Form expansions and expansibilities for Cold or Form contractions and contractilities; and *vice versâ.* Most Metals, therefore, have a double Force Negativeness, first, the Solidity that many of them may possess, and besides that, the Conductivity they all more or less possess, by which, specially if the Metals be positive, they can obtain during certain Chemicalizations, part of the Mean earth's great Cosmical planetary Cold or Force Negativeness. The Metal Hydrogen, however, has only the plus Contractiveness or Negativeness that Hydrogen can by its Conduction and force and form Reciprocity Earthwards obtain during Chemicalization from the Mean earth. Hydrogen, except for Conduction and force and form Reciprocity earthwards, is in all and other respects, highly positive in Character, Form, and Force.

It is evident, however, that the term Negative or Positive as applied to the Forces, Forms, and Characters, and Behaviour of the elements or chemicals, is a relative one. And the generality of the elements, All indeed except Nitrogen, can be Negatives, according as they are paired. Nitrogen, therefore, is the Positive element *par excellence*, the lightest, most gaseous, most expanded matter that is found cosmopolitanly native on Earth; in Nitrogen is housed the highest Positive Force on Earth. Nitrogen is the most powerful Expander of matter, the Grand Exploder among the Elements, and the Head of the Life Department of Chemistry.

Sulphur is a good Negative to Oxygen. Sulphur is Solid, Oxygen is Gaseous: not only so, but Sulphur is light, though solid, and is capacious and easily volatile, or is a potential Gas; that is, Sulphur has the form, force, and character Reciprocity towards Oxygen; and on its side, Oxygen, though gaseous, is ozonifiable, or easily condensable, and has some form Reciprocity towards the Sulphur. But Sulphur in its turn is positive to most Metals having a softer, a lighter, a more fusible and volatile, and a less conductive Solidity than most of the Metals.

Oxygen is one of the most positive of the Elements, and when acting *directly* nearly always so; but to Nitrogen and to the Halogens, by Chemical artifice or *indirectly*, Oxygen can act the Negative part by its retention or acquisition of the Dark radiation.

Certain Metals, such as Potassium, etc., are now held to be positive, and justly. For the pitch of the Solidity of these metals is a high one for Metals; by being light, fusible, and volatile, such Solidities are expanded or near to Liquidity or Positiveness. Compared with many other metals, expansion and expansibility preponderate in those metals over contraction and contractility, and make those metals Positives in the Metallic Class.

Certain other Metals, such as Platinum, etc., are held to be negative, and justly. For the pitch of Solidity in those Metals is heavy, further from fusion and boiling, or near to *plus* Solidity; compared with many Metals, contraction and contractility preponderate in such Metals over expansion and expansibility, and make such Metals Force Negatives, for the Metallic Class.

Absolute force Negativeness in the elements or chemicals, there is none amid the peripheral Chemicals of the Earth-globe. That would be the pulseless stillness of utter Death. And as long as Chemical Character exists *in* Matter, and Sidereal and Planetary Shine Powers, and Gravities, exist *for* Matter, there will be, even in the humblest and most solid peripheral Matter, some if little of the Morphigenic Thermal Force; that is, the more or less rapid Centripetal and Centrifugal Motions, or oscillations in Ethero Molecular Matter which constitute the Form and Colour pulse of matter, and which reach a culminating intensity of shortness and speed or of Momentum and Rarefaction, in the Ethero Molecular Matter of the Sky, and its Belongings, in that Matter which pervades and develops the living Organizations.

CHAPTER XXXI.

THE CLASSIFICATION OF THE ELEMENTS.—THE POSITIVES.

If Force Negativeness, therefore, be contraction or ready contractiveness, or solidity or ready solidifiability in an Element, then Force Positiveness will consist in the reverse, or will be epitomized in expansion or ready expansibility, gaseity, or ready gasifiability, produced in an Element, by its Chemical Character. Expansion, therefore, is the central attribute of Force Positiveness in an Element. And Gaseity being the form of matter that is the most expanded, stands roughly for the Force Positiveness in matter. And an Element if gaseous, and badly conductive, and stably bad Dark radiant, is, *ipso facto*, stably Force Positive. And the lighter and the farther Gaseity is from liquefaction, the greater is its expansion pitch or its Force Positiveness. Badly conductive and stably bad Dark radiating Nitrogen, and the Halogens are the most constantly Force Positive elements in Earth—and not so much the better conducting Hydrogen, nor the ozonifiable, better Dark radiating Oxygen; Nitrogen never and the Halogens, seldomest and badly, become Force Negatives, or Plus Form contractors, or coolers, to

r partners in chemical actions and combinations.
lrogen, it is true, is lighter, is more unliquefiably
ous, more cosmically heated or expanded than Nitro-
; and Hydrogen is thus far more Force Positive than
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Positiveness, at least, during certain mineral chemical
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mon form of Oxygen in the sky is badly Dark
iant, and that Oxygen in its Ozone allotropy is more
densed and more Dark radiant. We know, therefore,
t Oxygen's Radiation, even when Oxygen is single,
modifiable and unstable; and good Dark radiation
ns to its possessor, power of obtaining the Dark
t, the Lower pitches of Spectral Force, and the allied
ns, falling to contractions or towards solidities; that
powers of obtaining Force Negativeness. No such
rked instability in the radiation or conduction of
rogen or of the Halogens is found; both have stable
heat conduction, and bad Dark radiation. And
nifiable Oxygen, becoming connected with the Mean
l earth by Dark radiation, in union with Nitrogen or
logens, becomes to them a fair form condenser or force
ative. But this Oxygen does indirectly, and in
cent states, and by no means quite perfectly; the pure
rogenous and pure Halogenous compounds of Oxygen
ng, as a rule, unstable.

itrogen in action and out of action, of all the elements, yields up with the greatest reserve, the high pitched Spectral Forces which Nitrogen possesses from the Shapecraft. And light Nitrogen is, thereby, the most perfectly Positive of all the elements, the most stably and preponderatingly influenced by the highest, most gasifying forces of the Earth's Shapecraft. And as the native Nitrogen is itself the most unobtrusive of the Earth's matter, so are the ultra-violet Spectral Forces in Nature, that chiefly gasify Nitrogen, unobtrusive to us also.

Nitrogen's chemical inactivity with the common metals or with the purely mineral Earth and negatives, is small reproach to Nitrogen. Nitrogen is light (0·972) and is heat capacious (4·7), heat dilatable, very Bright radiant, very bad Dark radiant, and bad conductive. Nitrogen has, therefore, the highly positive chemical Character, and thereby easily and always obtains from the Shapecraft, and keeps stably, the most positive Morphigenic Thermal Force, the highest pitched Spectral Forces and Forms, extremely rarefied gaseity, much expansibility, great cosmical heatedness. Nitrogen, therefore, has plenty of the powers by which Chemistry evolves her miraculous polymorphism and polychromism in persolid, dormant, colourless matter, *provided* the matter have nitrogenwards the reciprocating Force and Form and Character.

The Morphigenic Thermal Forces and Forms offered by Nitrogen to the common Metals, are higher or more positive than those offered by Oxygen, by Ozone, by Chlorine; and the Nitrogenous Forces and Forms are so high that it is the Mineral metals and Mineral Earth that have not the reciprocating high Forces, Forms, and Characters towards the combining offers of Nitrogen; nor has, indeed, Nitrogen itself reciprocity for the low Metallic, over minus Forces, Forms, and Characters. But on Nitrogen's side it is over brightness or a sovereign greatness, soaring aloof, above the common herd, and reserving itself for higher and better things. Nitrogen should not therefore, singly or at all, bear the reproach of chemical sluggishness. For with Carbon and Hydrogen which have like Nitrogen the highest thermal capacities and lightness, and with Oxygen, with those crowned heads of Chemistry,—Nitrogen plays a sovereign's part in the noblest task of Chemistry, that of Life.

The offered positive morphigenic energies of Oxygen towards the mineral Metals, or to the Mean earth, are less than those vouchsafed by Nitrogen. Oxygen is heavier (1·105), less heat capacious (8), less bright radiant. Oxygen meets, therefore, from Metals and the mineral Earth, a readier force, and form, and character, Reciprocity for Oxygen's lesser force positiveness. And the Positive force offers of Ozone, being still less than those of the commoner Oxygen, Ozone is directly more minerally active than Oxygen itself. Chlorine is still heavier, more condensed, less gaseous, less cosmically heated than Nitrogen, or Oxygen, or even Ozone itself. And the force mediocre Chlorine finds among the Metals, as Mediocrity finds among men, more general appreciation and recognition, more chemical Reciprocity or affinity than Nitrogen or Oxygen, or Ozone. In other words, free Chlorine attacks free Metals on which free Oxygen has little direct action.

Nitrogen stands at the head of the force Positive elements and chemicals. We perceive by the huge forty miles deep atmospheric Ocean that surrounds and encases the Earth-globe that Nitrogen is stably the lightest, the most expanded, the most unliquefiably gaseous, the most cosmically heated Native matter, on this Earth. In other words, we perceive that Nitrogen's ethero molecular matter has such a character that it is bandied to and fro, between the Sidereal shine powers and the Earth's own shine powers or impulses, in the quickest molecular pulse motions. In the Nitrogen of the vast Air Ocean of the Sky, is contained an ENORMOUS ethero molecular pulsation Force, but only for choice matter, or for matter that can appreciate this Force, matter that can, in a measure, accept or reciprocate this Force, or that can keep step with Nitrogen at something like its momentum of molecular pulse speed. You cannot expect this from Platinum, from the Metals, from the Mean *mineral* earth herself, if you note their Forms, their Forces, their Characters; they all move, they also pulsate, but it is only in the lower, slower clefs of form and Spectral Force; they may keep step but only with such slower runners or chemical dancers as Oxygen or Chlorine, or the still humbler Metalloids, but not with the speed of the King of Life, not with Nitrogen. And the word sluggard befits every other native Chemical on Earth much better than that Nitrogen which moves with Life. Nitrogen makes no chemical stir amid the comparatively lazy Minerals, for it has chosen organic Chemistry, the better part—the Life part—that cannot be taken from Nitrogen.—And Nitrogen, freely, laughably vituperated by Man, and styled Azote, Stickstoff,* Oxygen Diluter, and what not, is solemnly crowned in Chemistry the King of Life, since Nitrogen is the highest positive chemical in all the breathing Lives of Earth.

* Stickstoff, or chokestuff, is the German name of nitrogen.

The native Nitrogen on Earth has a most unobtrusive Form. We are unconscious of Nitrogen's existence in still air, and the correlated Force that makes this unobtrusive Nitrogen form, is itself also unobtrusive, specially the Ultra-violet Spectral Force. Howbeit we are not left entirely without an inkling of the enormous, unobtrusive, Forces housed in Nitrogen. For although we do not see Nitrogen's great expanding Forces burning or acting like those in Oxygen burning with Hydrogen or Carbon, still the mind perceives the greatness of the expanding Forces of Nitrogen, its Plus cosmical heatedness, because Nitrogen is the most unliquefiably gaseous of the Earth's native matter, and occupies high and essential parts in the Vitalities of Earth-matter, and because weakly compounded Nitrogen is terribly or dynamitically explosive—Nitrogen, in truth, existing constantly *exploded* in vast Aërial Masses all round the Earth Globe while called the Earth's Atmosphere. And, indeed, this frightful explosiveness in weakly-bound and even Native Nitrogen teaches us how tremendous are the Plus Forces that Nitrogen furnishes to the Lifeholders it essentially inhabits, and how great, indeed, must be the Contracting Forces also used in the Lifeholders, or how reciprocatively perfect are the Plus and Minus ethero molecular forces that oscillate for a lifetime in Living Beings, from the Shapecraft through the noble Organic Elements. And we submit that it is because Nitrogen is very sensitive to the expanding pitches of the Spectral Force of the Shapecraft; it is even because Nitrogen is dynamitically explosive that Nitrogen has the correlated power to control the Death-giving forces of contraction, present also in the Lower pitches of the Spectral Force of the Shapecraft, and working specially through Carbon and the Mean earth—in other words, Nitrogen's enormous Explosive Powers are correlated to its Life-giving Powers.

It follows that to coerce this very great expanding Force transmissible to Nitrogen from the unobtrusive pitches of Spectral Force of the Dayshine and Nightshine of the Earth, we must employ plenty of the contracting Force transmissible through Carbon and the Mean earth; we must combine Nitrogen with plenty of conducting and Dark radiating Elements possessing the Force, Form, and Character reciprocity with Nitrogen. In other words, Nitrogen, explosive though it be by the unobtrusive expanding Spectral Forces of the Shapecraft, may still produce, with plenty of Carbon, plenty of Hydrogen, plenty of Oxygen, stable, or at least not *very* explosive, Compounds; for the expanding forces reaching Nitrogen from the Sidereal part of the Shapecraft are met, in these Compounds, by very strong contracting force reaching Carbon, Hydrogen, and Oxygen from the Earth's part of the Shapecraft, by conduction and Dark radiation and capacity in those Elements. The expanding force is, therefore, in these Nitrogenous compounds, well-balanced by the best contracting force in the Shapecraft or Chemistry, that of Carbon and that of the Mean earth, through conducting Hydrogen and Dark radiating, ozonifiable Oxygen.

With Iodine and Chlorine, however, Nitrogen, in very artificial circumstances, indirectly makes compounds, for Iodine and Chlorine have reciprocating negative forces and forms to Nitrogen; and there is, therefore, a possibility of the local force and form Balance or of the Combined state between them. But Chlorine and Iodine are not good conductors nor good Dark radiators, nor yet good Force and Form Reciprocals of the Mean earth. In com- g with Nitrogen, therefore, they furnish to Nitrogen only their own Local Negativeness or Form Contracting Power, which is much weaker than the cosmical force Negativeness derived from the Mean earth by conducting and Dark radiating, good force and form reciprocative Elements, such as Carbon, Hydrogen, and Oxygen. Consequently neither Iodine nor Chlorine furnishes to their explosive partner, Nitrogen, so perfect a form contracting Force, or Anti-explosive Force, as plenty of Carbon, Hydrogen, and Oxygen do. In other words, the compounds of Nitrogen with the Halogens, Chlorine, and Iodine, are unstable, or comparatively imperfectly contracted or explosive. And so, indeed, are the compounds of Nitrogen even with Carbon itself, if the Carbon be scant, so great is the expanding, exploding power of the unobtrusive Highest pitches of the Spectral Force of the Dayshine and Nightshine over the Quintessential Form of all Nitrogen.

There are, therefore, two kinds of Force Positiveness in matter, the greatest and the purest force positiveness existing most specially in Nitrogen, and also, in the next degree, in the Halogens, and next in the somewhat mixed force positiveness, of which Oxygen and Hydrogen are types. After Nitrogen, the Halogens, Hydrogen, Oxygen, come the rest of the Metalloids in the series of force positiveness, such as Phosphorus, Sulphur, etc., etc., since, as a rule, the Metalloids, compared with Metals, have the Positive Force, Form, and Character. Hydrogen and Oxygen, therefore, although at first sight appearing altogether Force Positive, since they are very gaseous and expanded, are not always so.

Free, gaseous Hydrogen is so rare and scant in Nature that it may be regarded as not existing in Cosmical Chemistry. But Hydrogen in its Oxide, or as Water, forms a most extensive and important Cosmical Chemical, pervading and unifying the Peripheral Matter of the Earth, and partaking remarkably of the Forms and Forces both of the Surfaces of the Earth and of the Earth's Lower and Mid airs, and being thereby the best Solvent on Earth.

The Metals, therefore, are the force negative Elements, and the Metals' conduction would singly greatly confer on them force negativeness, by bridging to them the great force negativeness, or the Cosmical cold, or the form-contracting, solidifying Force of the Mean of terrestrial Morphigenic Thermal Forces, or of the Mean earth. But besides their conduction, the Metals, as a rule, are less fusible, less volatile, less expansible, less coloured than the Metalloids. The Metals are heavier, more heatably capacious, more conductive, more dark radiant than Metalloids. The Metals have the Negative Force, Form, and Character.

The Metalloids are the force positive Elements. Their bad conduction, bad dark radiation, isolate them better from the planetary Cold and Shade of the Shapecraft. Their greater lightness isolates them better from the Plus pressures of the Gravities. Their greater storing capacities, and dilatabilities, and bright radiation bring on them the Preponderance of the positive forces, and push the Metalloidal Force and Form to or towards expansions and expansibilities, Gaseity or Gasifiabilities.

But the metallic and metalloidal Groups of the Elements may themselves be subdivided into positive and negative Subgroups, the widest reaching rule being that the Minus contracted and Minus contractible Element is Positive to the Plus contracted or Plus contractible Element, or that the Minus expanded and Minus expansible Element is Negative to the Plus expanded and the Plus expansible Element.

CHAPTER XXXII.

CLASSIFICATION OF CHEMICALS: THE BASES, THE ACIDS, THE SALTS.

WHAT is true of the force Classification of the Elements, or of the Metals and Metalloids, or of the Homogeneous forms of Chemistry, or as it were of the chemical Mothers and Fathers, proves true also for the force Classing of their lineal descendants, the Acids and Bases;—the Acids being the force Positive, the Masculine chemicals, and the Bases the force Negative, the Feminine chemicals.

We have argued that the chief and best characteristic of Force Negativeness in chemicals is Plus contraction or Plus contractiveness, with sensitiveness or reciprocity for the expanding or the force Impregnating actions; and in the Ingredients of a Base, since they become Force Negative, we observe intense or the Plus contraction during their basification. And some Bases' ingredients, such as those of Lime, reach the most plus or lowest contraction, and become persolids or badly soluble, badly fusible, and strongly fixed solidities. The ingredients of Lime while free are the fusible metal, Calcium, and the nearly unliquefiable gas, Oxygen; and yet, while compounded into Lime, Calcium and even Oxygen become infusibly solid. Both the Metal and the Oxygen in Lime, therefore, have lost much expansion, or have acquired much contraction or Force Negativeness, and both, therefore, become Basic; and the ingredients of Lime, the Metal and Oxygen, so contract because in ozonifiable Oxygen there are the potentials of the Dark or the Cold radiation, and in the Metal there is the Cold conductivity, and often Weight, or the Plus pressure, and around the Metal and Oxygen, on Earth, there are the low, dark, cold pitches of the Spectral Force of the Dayshine and Nightshine, and gravity, or Plus pressure, for such Matter on Earth as can radiate and conduct and appropriate them.

The base Ammonia is, however, gaseous, and has, therefore, at first sight, a strange Form for a base. Howbeit Ammonia has the chief characteristic of Bases in high degree. Ammonia is a very soluble, very liquefiable, very solidifiable gas, or Ammonia has gaseity's form, but of a pitch that is on the very brink of Liquidity and even Solidity: a gaseity in Ammonia of a very different pitch from that of the Hydrogen or of the Nitrogen that combined make Ammonia, and even from that pitch of gaseity in which the average of the gaseous Acids exist. Thousands of atmospheres' pressures would be needed, at common temperatures, to bring the gaseous pitch of the free ingredients of Ammonia, the Hydrogen, and Nitrogen, to the gaseous pitch of Ammonia itself. And, indeed, at common temperatures, Nitrogen and Hydrogen, the ingredients of Ammonia, are utterly unliquefiable Gases. The ingredients of Ammonia, therefore, while forming Ammonia, as compared with themselves while free have lost enormous Expansion Power; in other words, have acquired great Contraction, that is, Force Negativeness and Basity. And the ingredients of Ammonia, Hydrogen, and Nitrogen, so contract, because Hydrogen has cold and heat conductivity or the facilities of being cooled of its heat or of being frozen by the planetary Cold and Shade of the cosmical Shapecraft of the Earth, and has also force and form reciprocity to the Mean earth, and thereby Hydrogen has also facilities of freezing, or of contracting, or condensing Nitrogen or any of its molecularly touching neighbours. And we note that the Hydrogen which brings this Cosmical Cold or Contraction *into* Ammonia is in much excess over the Nitrogen, the great rebel to the cosmical Cold, the most stably Gaseous matter on Earth, the most stably cosmically-heated or expanded Element in Chemistry, the most explosive Chemical we know, the substance specially dedicated to Life. And consequently no Nitrogen ever sinks on Earth into the persolidities common in the Oxygen-begot Minerals. The stable and easily-solidifiable Gaseous form-pitch of Ammonia is for the very dilatable, very explosive Nitrogen, a very contracted form-pitch indeed, and is Basic, or *tending* towards contractions.

Among the ingredients of Bases, therefore, the Metalloid or the matter that has the positive character, and specially the metalloid Nitrogen, because it has the most stable and highest positive character, never preponderates; but, on the contrary, the Cold, Form contracting, conducting or metallic ingredient may preponderate. In Ammonia we have three equivalents of the Conducting Hydrogen present, for one of the Nitrogen.

And in the Organic Bases, say Morphia ($C_{35}\ H_{20}\ NO_6 + 2HO$),* the form-contracted and the potentially form-contracting ingredients, namely, persolid Carbon, and the conducting Hydrogen, and the ozonifiable or potentially contraction radiating Oxygen, may, and do, preponderate in those Alcaloids, but never the more purely force and form Positive Nitrogen: it cannot figure prominently in contracted Basic Forms, or in the Alcaloids.

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* I keep to the oldest notations until chemists have done changing them.

Acids, however, spring from preponderating equivalents of Metalloids. And you may turn some Bases into Acids merely by increasing in them sufficiently the equivalents of the Metalloidal ingredients. Acids spring from ingredients that have the more positive Force, Form, and Character, or from the Metalloid class. In the ingredients of Acids, or in acidifying actors, the contracting attributes for the Cold or the conduction and radiation being less, the acidifying action occurs more locally, or more between the immediate actors themselves; that is, the mean of surrounders, the planetary cold or contraction of the Mean earth takes less share in the acidifying than in the basifying action. And the form contractor or the negative actor of acidifying actions is the more contracted or contractible Metalloid of the two that act. The true, the radicle, the anhydric Acid, therefore, cannot be so contracted as the Base, for the form contractor of the Acid action is itself a Metalloid, or more positive in Force, in Form, in Character, than a good form contractor or negative ought to be; besides, the contraction in Acid actions is local, and weaker than the cosmical or the Basic contraction. Hence the radicle anhydric Acid is often difficult to make, or is unstable when made, or not to be made at all in their isolated state.

Combined with the metallic Oxides, such as water, and the bases, the acid Radicle at once obtains stability or the strong form contracting Force of Chemistry, that of the Mean earth. And it is evident, also, that that acid which has the persolid Carbon for its negative or for its form contractor, will be stable, even in its radicle or anhydrid state, having the excellent negative Carbon in its form. Carbonic Acid is, therefore, very stable indeed.

The most typical form for acidity is greatly the reverse of the typical form for the base. The Acid tends to expansion and expansibilities, the Base tends to contractions and to contractilities. Mean acidity compared with Mean basity has decidedly the dilated and dilatable Force and Form and Character; that is, Acidity is positive to Basity. Several Acids are gaseous, some are volatile liquids, and the Acids that are solids, have light, soluble, fusible, volatile, unfixed, solidities.

In a *Salt* there exists no pronounced preponderance of either of the Forces of the Shapecraft. A Salt is never pergaseous or persolid, but must be something between them. Salts are neither very expanded or force positive, nor very contracted or force negative. Salts are, as it were, in one sense, Force Neutrals, and are not poisonous, specially when compared with the Elements from which the Salt springs, or even with their Acid or Basic progenitors. All the ingredients of a Salt have equalized their Extreme of forces among each other, and towards the Mean of terrestrial Morphigenic Thermal Forces; and the Salt's ingredients have thereby greatly lost the excess of either the plus or the minus Forces, which they may have originally possessed when free or as elements or parent forms. Salts are force Moderates; and as such Salts are most readily made from plus and minus Elements that have themselves the moderate force, form, and character; such as the Halogens, on the one hand, and the Alcaline and Earthy metals on the other.

And because Water has a Midway form which is cosmopolitan or predominant on Earth, the force moderate Salts can incorporate water into their structures readily in what is called their Water of Crystallization. Water, moreover, of all terrestrial cosmopolitan matter exists on Earth, native, simultaneously and changingly, in all the three major or primary forms and forces of matter. Water or the Oxide of Hydrogen exists as the rocky, glacier Solid, called ice. Water exists Liquid on the face of the Earth. Water exists viewless and Airlike in air. Liquidity and the moderate Solidity and Gaseity come quite natural to Water. Hence Water is at home in the Acid form, since acids are moderately expanded forms. Water is at home in many Bases, since they are not over heavy and contracted forms. And, lastly, Water is at home in the Salts, for they have the midway or the neutral or the moderate form. The characteristic of Salts being their Force Moderation, Salts are not poisonous, and cannot act upon each other and upon Fauna with great violence and metamorphosis.

CHAPTER XXXIII.

THE INTERACTION OF THE POSITIVE AND THE NEGATIVE CHEMICALS.

In all Chemicals there is a Morphigenic Thermal Force. And this most important Force is correlated to the Quintessential Form and Form pitch of matter, and also to the Character of matter. In other words, Form and Form pitch, Force and Character in matter, stand more or less for each other or are cognates.

The Force, the Form, the Character, can be Negative, Minus, Planetary, as in Metals, in Carbon, in Carbonoids, and in Bases.

The Force, the Form, the Character, can be Positive, Plus, Sidereal, as in Metalloids and Acids.

The Force, the Form, the Character, can be Neutral or Moderate, neither greatly Plus or Minus, as in Salts.

Expansion and Expansibility in the Form and Form pitch of chemicals are as a strain in them and indicate in them, when single and when compounded, or when juxtaposed to others, atomy to atomy, before and after action or combination—Form-expanding powers, Plus heating powers, Gasifying powers, Plus character-inducting powers, on their juxtaposed or compounded neighbours.

For Expansion and Expansibility in chemicals are correlated to Plus Spectral Force, to short quick pulses, in more rarefied ethero molecular matter of chemicals, during the Dayshine and Nightshine on Earth—to Plus cosmical heatedness, to Plus electricity, to Sidereal Force in matter, to Gaseity and its pitches—to Volatility or Gasifiability in matter, and to the Plus Character in matter.

Contraction and Contractility in the Form and Form pitch of chemicals are as a strain, and indicate in them, when single or when juxtaposed to others, Atomy to Atomy, before and after combination Form contracting powers, Minus heating, or Cooling powers, Minus character-inducting powers on their juxtaposed or compounded neighbours. For Contraction and Contractility in chemicals are correlated to the Minus Spectral Force, to the longer, slower pulses, in denser ethero molecular matter of chemicals, during the Dayshine and Nightshine, to the Minus cosmical heatedness or to Cooledness, to Minus electricity, to the Planetary Force in matter, to Solidity and its pitches, to the Liquefiabilities and Solidifiabilities in matter, and lastly, to matter's Minus Character.

When, therefore, you touch Sulphur with Oxygen, Sulphur reciprocates and touches Oxygen also, and you bring reciprocating electrically Negative Atomies, those of the solid Sulphur near to reciprocating electrically Positive Atomies, those of the gaseous Oxygen, and *vice versâ.* And in the compact, ethero molecular, pulsating Plenum of the Peripheral Earth the positive, rarefied, Oxygenous Atomies will be pushed and will be dovetailed towards the Negative and more condensed Sulphur Atomies, and *vice versâ*, or the two sets of Atomies in Sulphur and Oxygen will seem to attract each other in the Plenum, and will be marshalled and juxtaposed on each other, plus Oxygen Atomy against minus Sulphur Atomy. In other words, the chemical, selective, molecular Attraction, the first step in Chemical Action, in Sulphur and Oxygen and all other Actors, is as the Electric Attraction, the more contracted or the more contractible Actor standing for the Negative, and attracting the more expanded or more expansible Actor that stands for the Positive, and *vice versâ*. Positive Oxygen and negative Sulphur brought together molecularly, therefore, attract each other selectively, after the manner of the Electric attraction. And we have the Oxygen representing plus electricity and the plus electric power; plus heatedness and the plus heating power; plus expansion and the plus expanding power; representing gaseity and the gasifying power; plus character and the plus character-inducting power; and we have the Sulphur representing minus electricity and the minus electric power; cooledness and the cooling power; contraction and the contracting power; representing solidity and the solidifying power; the minus character and the minus character-inducting power.

These Forces and Forms were impressed on Sulphur and on Oxygen through their Characters by the Spectral Force of the Dayshine and Nightshine and the gravities of the Earth, and tend to be stable when Oxygen and Sulphur are single, but when Sulphur and Oxygen are attractively juxtaposed, Atomy to Atomy, then the two begin to influence reciprocatively each other's Character. Oxygen's expanding heating powers and plus capacity improve those in Sulphur, and thereby improve, at the same time, Sulphur's higher radiation or its powers of quicker molecular pulsation, and deteriorate dilating

Sulphur's conduction. The presence of Oxygen's Atomies against those of Sulphur, therefore, induct a rise in Sulphur's Character, and, with the plus or risen Character, produce in Sulphur the powers of taking from the Shapecraft and the Oxygen the plus Force and the plus Form; and it is in this manner that the Sulphur, Oxygen-clothed, can be gasified into its part in Sulphurous acid gas.

On the other hand, Sulphur's contracting, cooling powers and capacity improve those in Oxygen, improve, therefore, at the same time, Oxygen's lower radiation or Oxygen's power of slowing molecular pulsation, and improve also condensing Oxygen's conduction. The presence of Sulphur Atomies against those of Oxygen induct the fall in Oxygen's Character, and with the minus or fallen Character in Oxygen produce there the powers of taking from the Shapecraft and the Sulphur the fallen, minus Force and *Form Pitch;* and it is in this manner that Oxygen, Sulphur-clothed, can be condensed from a nearly unliquefiable Gas to the brink of Liquefaction in its part of Sulphurous acid gas.

It is evident, however, that the Character neither of Oxygen nor of Sulphur is destroyed by their juxtaposition or combination, but only modified; for we know that as long as we keep Sulphur *heated* by common or local heat we keep Sulphur's Capacity, Dilatability, Radiation improved, and its Conduction deteriorated, and that as soon as you take away your Local heat, Sulphur tends to relapse into its old Character; and I argue that what happens with Local heat happens also with the Cosmical heat. As long as you keep Sulphur heated by the Cosmical Heat that is transmitted to Sulphur through its partner, the juxtaposed Oxygen, by the Shapecraft, as long as you keep

Oxygen and Sulphur combined, you keep improved Sulphur's heated Character so as to enable it to gasify as Sulphurous acid, for Sulphur is then constantly heated by the Shapecraft through Oxygen. But if you take away the source of this Cosmical Heat from Sulphur, if you take away the juxtaposed Oxygen, the now unheated Sulphur relapses into its old Character and Form and Force, under the action of the same Shapecraft.

The phenomena between juxtaposed Oxygen and Sulphur, called Chemical action and combination, or the burning of Sulphur in Air, are paralleled by the phenomena of Electric actions. In the Oxysulphurous action, the solid, contracted Sulphur corresponds to the negative Electric actor, and the gaseous expanded Oxygen corresponds to the positive Electric actor; and the Selective attraction between Sulphur and Oxygen corresponds to the Electric attraction of Negatives and Positives; and the Character and Thermal inductions between Sulphur and Oxygen correspond to the Electric inductions; and the oscillatory Force and Form discharges between Oxygen and Sulphur amid Ether, or Oxygen's and Sulphur's mutual combustions, correspond to the Electric Spark amid Air; and the final equilibrium between the Forces, Forms, and Characters of Oxygen, Sulphur, and the Shapecraft, correspond to the Form changes and Equilibria in the cells of Galvanic electricity, and even in Friction electricity; though the Form changes in Friction electricity are so molecular and superficial that they are the most unobtrusive of all the Form changes correlated to Electricities.

To understand even the simplest of Chemical Actions, therefore, such as that between Sulphur and Oxyge
and Oxygen and Sulphur—you must regard it from

sides; you must regard it in its relations to Heat and Light, and to Cold and Shade; in its relations to the Plus and the Minus electricities; in its relations to the Expanding and Contracting motions and to the Gasifying and Solidifying power; nor can you for a moment, in any action, leave out of mind the ever active presence of the Shapecraft of the World; that is, the Powers that mould matter, the Gravities, and the Dayshine and Nightshine, the Sidereal and Planetary Forces of the Earth, of the Solar System and of the Universe; and you must also consider the plus and minus Character of matter, or matter's plasticities to the Shapecraft.

In a Chemical Action, the heated, lighted Actor heats and enlightens the Cooled, shaded Actor; but the cooled, shaded Actor always reciprocates, and in its turn cools and darkens the heated and lighted Actor; and you will never clearly conceive the simplest Chemical Action, unless you admit and remember always, this never failing, reciprocal, *vice versâ* duality of all Chemical Actions, and their cognates or correlates. In a Chemical action, therefore, there is double Reciprocity of action, an advance and recoil action, an Oscillatory action between Contraction or Centripetal motion, and Expansion or Centrifugal motion, in ethero molecular matter, leading to the Oscillatory phenomena in Ether and ethero matter called Light and Heat, and to their static equilibria, in the Form and Colour pulse of matter.

In a Chemical action, therefore, the expanded actor expands the contracted, but is itself simultaneously contracted by the contracted or is resisted by the recoil of the contracted. The gasified Actor does its best to gasify the solid Actor, while the solid Actor is also doing its best to solidify the gasified Actor. The Plus Character in an actor is always inducting its like on the Minus Character of the brother actor, and *vice versâ*. In Chemical Action, therefore, the actors are always one positive and the other negative.

In the Sulphur and Oxygen action, the positive, gaseous Actor, and the negative Solid Actor, and their Force, Form, and Character reciprocity, are obtrusively or easily seen; but, in some cases, where there exist in the actors good cold conduction and also good Dark or cold radiation, as in oxymetallic, direct actions, one of the actors, which is the Mean earth, is unobtrusive.

For there exists for Chemical Philosophy or Theory, a Mean earth, with its Mean terrestrial Force, Form, and Character. An abstract Mean terrestrial chemical Character, an abstract Mean Morphigenic Thermal Force—a Mean terrestrial gravity, and compass of the Spectral Force, and an abstract Mean terrestrial form. This Mean Force, Form, and Character of the Earth is Planetary and Negative, and its gravity pressure is 5½—its Spectral Force is Cold and Shade, and its Mean shape is solid and contracted.

All Chemicals, in action or out of action, but specially in action, tend to equilibrize in Force, in Form, in Character with this negative Mean earth. The Elements that are too positive to this Mean—such as Oxygen, Hydrogen, etc., best equilibrize with it, in the proportion in which they can be weighted or brought to conduct and radiate the lower pitches of Spectral Force, which are intrinsically Cold and Shade. The Elements that are too negative to this Mean, such as very *hard* Carbon, etc., are best equilibrized with it in the proportion in which they can be lightened or brought to conduct badly and to radiate the upper pitches of Spectral Force, which are intrinsically plus Light and Heat.

When Oxygen and Sulphur act or burn together they burn in the presence and under the influence, not merely of each other, but also of the Mean earth. And the experimentally ascertained chemical Characters of Sulphur and Oxygen are such, that Sulphur and ozonifiable Oxygen can be brought only to *radiate* the Mean's Dark or minus heat or cosmical cold, but not to *conduct* the Cold. The exchange between the Mean earth's cold and contraction on the one hand, and the burning Oxygen's and Sulphur's heat and expansion on the other, lacks Conduction in the Actors, and is onefold or not therefore of the thoroughest. The likeness in Heat and Cold, in Expansion and Contraction, the likeness in form and aspect, between the Compound formed by the Action of burning Sulphur and Oxygen, and the Mean itself, is therefore not so striking. And the Sulphurous acid form change, the result of Sulphur's burning in Air, is more localized to the Actors, and is still Gaseous, or still positive and unlike to the Mean earth.

It is, however, different, when instead of a very bad conducting Actor like Sulphur, a good conducting Metal acts or burns with ozonifiable Oxygen under the influence of Mean earth. For if we, with our finger, touch Sulphur and a Metal strongly and equally heated or cooled, the good conducting Metal will heat or burn us, will cool or frostbite us, more readily than the bad conducting Sulphur. And as the Metal better cools or heats our fingers than Sulphur does—so the Metal heated in its Oxygenic action or burning, better cools itself and Oxygen, or better heats or burns the Mean earth than burning Sulphur heated in its Oxygenic action does.

When conducting Metal and ozonifiable Oxygen act together in the presence and under the influence of the Mean earth they can be brought not only to *radiate* through Oxygen the Mean's dark minus heat or cold, but also through the Metal to *conduct* the cold; that is, in such an action heat and expansion escape twofoldly or the most readily from the obtrusive actors, the Metal and Oxygen, to the unobtrusive actor, the Mean earth. In the Oxymetallic Action, therefore, the unobtrusive Mean takes a greater share, or there is possibility by *radiation* and *conduction* of a twofold or of a more thorough exchange of Spectral Force and of the correlated forms. Heat and expansions from both of the obtrusive Actors, cold and contraction from the unobtrusive Mean, oscillate together in Ether and ethero molecular matter, and produce the phenomena of Metallic Burning in Air and on the Earth's surface; and consequently a more perfect likeness between the Metallic actors or burners, and the Mean earth occurs in such burnings. And so like, indeed, are some of Oxygen's metallic ashes or the compounds of Oxygen-burnt Metals to the Mean earth, that they are called the *Earths*. In the resulting compounds of Metallico-Oxygenous burnings the Local force and form Equilibrium between the actual burning Metal and Oxygen themselves is a *secondary* matter, or is almost masked by the more thorough Equilibrium of Force, Form, and Character that the Local obtrusive burners take with the very unobtrusive Cosmical Mean earth. And the remarkable transformations undergone by Metallic Burners may puzzle Theory if this relation to the force, form, and character of the Cosmical Mean Earth, is not borne in mind. This function of the Mean earth in these metallic actions is paralleled by the function of the Mean earth in Electrics.

We know that the Mean earth is a vast Reservoir for Electricity, that is, for those pitches of Cosmical Heat and Cold, or Spectral Force, in which the average transactions the Earth's Chemistries and Physics are occurring, and from which the stabler Airs, and specially the Nitrogen Air, are greatly excluded. Hence dry Air in which Nitrogen greatly preponderates is a non-conductor or a very good insulator of the so-called *Amber Forces* or Electricities.

CHAPTER XXXIV.

THE BURNING OF SULPHUR AND OXYGEN.

SULPHUR is solid. It is, therefore, a force Negative, a cosmically cooled and contracted Element. But Sulphur is not heavy, is heat capacious and heat dilatable, that is, fusible and volatile. Sulphur, therefore, can appropriate plus heat and its expansions, both Cosmical and Local, when either come to preponderate for Sulphur. Oxygen is a light gas or a steam of at least 1,354 Atmospheres' high pressure power, because Oxygen's expansion has been, at common Temperatures, exposed to this most enormous pressure without liquefying. Oxygen is, therefore, a force Positive, a cosmically heated and expanded Element. But Oxygen is not too light, and is cold capacious and contractible and potentially Dark radiant, and ozonifiable Oxygen can therefore appropriate cold and contraction, both Local and Cosmical, if either come to preponderate on Oxygen. If, therefore, you bring Sulphur and Oxygen molecularly together Sulphur will represent the Stable or the Cosmical cold and contraction to touching Oxygen or others; and the Oxygen will represent the Stable or the Cosmical heat and expansion to touching Sulphur or others. In addition Sulphur represents the negatively electrified Actor, and Oxygen the positively electrified; and the Oxygen and the Sulphur come, therefore, to attract each other, Atomy to Atomy. Consequently you touch all the Atomies of Oxygen with cold and contraction, viz., those of Sulphur, and you touch all the Atomies of Sulphur with heat and expansion, viz., those of Oxygen. You get Cosmical Heat to preponderate over Sulphur, and Cosmical Cold to preponderate over Oxygen, and in both cases at molecular, selective, intensifying *contacts*.

Now solid Sulphur is volatile to preponderant intensified heat Locally applied by Fire, and gaseous Oxygen is condensable by preponderant or intensified, Local cold or freezing mixtures; and Cosmical heat and cold and Local heat and cold are in essentials the same Forces. Sulphur will then in this position cool down and contract its molecular neighbour, the Oxygen; and the Oxygen will heat up and expand the Sulphur, until the Oxygen and Sulphur reach a Shapecraft or Cosmical temperature between the Heat of Oxygen and the Cold of Sulphur, between the Expansion of the Oxygen and the Contraction of the Sulphur. Oxygen, therefore, after its combination with Sulphur, Oxygen as ingredient of Sulphurous acid gas, is almost a Liquid, liquefying with only Three Atmospheres' pressure, whereas One Thousand Atmospheres' pressure will not liquefy free, unsulphured Oxygen before combination. And Sulphur, after its combination with Oxygen, Sulphur as an ingredient of Sulphurous acid gas, is Gaseous, whereas, when free, Sulphur is solid and so contracted that it only expands into gas with a Thousand degrees of Fire heat or of molecular expanding Force. And in this Action, considered as a purely Heating and Cooling action, or in the

Sulphurous acid, the Sulphur is heated stably and the Oxygen is cooled stably, because the heating Heat and the cooling Cold are Shapecraft heat and cold, the Cosmical, the Stable heat and cold of the whole Earth; and because in this action the Characters of Sulphur and Oxygen are reciprocally modified into a Mean and New character, in which that of Oxygen sinks and that of Sulphur rises in correlation to the Rise and Fall of the Forces and Forms of Sulphur and Oxygen in Sulphurous acid gas.

But neither Oxygen nor Sulphur is alone in the Earth—both are Integrals of the Mean earth, whose Mean morphigenic thermal force, or Gravity and Spectral Force and Form are correlated to a heavier and more contracted, harder, less fusible Solidity. There exists, therefore, for Oxygen and Sulphur, besides their own, another force, form, and character Disequilibrium, that, namely, between them and the less expanded or cooler Mean earth, and with this Disequilibrium there is in Sulphur and Oxygen, as oxysulphurous matter, a tendency to force Equilibration. But so to equilibrize Oxygen and Sulphur must disoccupy or dislocalize much Expansion Force, as sensible Heat and Light, which must escape from Sulphur and Oxygen to the Mean earth, in the proportion in which Sulphur and Oxygen radiate cold and conduct heat and cold; but as neither conduct at all well they, in this Action, only radiate the Mean's cold; and less escape of Heat or entrance of Cold can occur between Oxygen, Sulphur, and the Mean during their rapid burning or chemical action. Oxygen, therefore, in this Sulphur-burning, remains still Gaseous and unlike the Mean, although condensed in Sulphurous acid to the very brink of Liquidity. And the foregoing partial Isolation from the Mean is Characteristic of the combinations between many Metalloids, since they, as a rule, conduct worse than Metals.

We recapitulate. — The Oscillations of the forces, forms, and characters, between Sulphur and Oxygen, while burning—the dislocation, oscillatory passage and exchange, and final re-equilibration of burning Oxygen's and Sulphur's plus and minus Morphigenic Thermal Forces, are comparatively localized to the actors and burners themselves and isolated from the Mean around them. The reciprocating Force and Form exchange between the burners themselves is favoured by their Characters and by their electric-like, selective Attraction, and their close molecular Juxtaposition. But the Force, and Form, and Character exchange between the obtrusive Oxysulphurous burners and the unobtrusive Mean earth, is less favoured, since these burners only *radiate* but do not *conduct* towards the Mean earth all their mutual Forces, Forms, and Characters. The resulting compound, or, as it were, the ashes of the Sulphur and Oxygen burning, rather retain an equilibration between the Forces, and Forms, and Characters of the obtrusive actors, the Sulphur and Oxygen themselves than acquire a strong likeness or equilibration with the Mean earth. Sulphurous acid gas, therefore, is higher in form, in force, in character than the Mean Earth, and has the Hydrohalogenic type of Force, and Form, and Character, which is in Chemistry called Acid.

In the Oxygen of the Air, in which Sulphur burns, there is an expanding force or a centrifugal power so great that Oxygen, though quite Solidifiable matter, is yet Gaseous, and, indeed, resists unliquefied a Thousand Atmospheres' pressure. Oxygen, therefore, clearly represents in the Sulphur burning the expanding force; Oxygen has the Plus heatedness, the Plus or violet-blue pitch of Spectral Force, Oxygen is the positive burner, the inflamer, the male actor, the force impregnator, the Supporter of combustion. Oxygen is so expanded that it cannot at common temperatures be liquefied by any pressure of Art; but that is the Oxygen free, and at the beginning of the Sulphur burning; but the Oxygen at the burning's end, the Sulphured Oxygen is, at common temperatures, easily liquefied. By burning Sulphur, therefore, Oxygen has discharged very great expansive Force. And what has become of that Force? The Force cannot have been wholly lost.

In Sulphur there is such a contracting or centripetal Force that Sulphur is a solid that resists nine hundred, and needs a thousand, degrees of Fire heat or molecular expanding Force to make or to expand that solidity into a Gas of 2·2 density. Sulphur, therefore, clearly represents in the Sulphur burning the contracting, centripetal Force. Sulphur has the Minus heatedness, or the cosmical Cooledness, the yellow, solid pitches of the Spectral Force; Sulphur is the negative, the female actor, the force impregnated, the inflamed, the Combustible Burner. Sulphur, free, at the beginning of the burning, needs a Thousand degrees of Plus heat or of molecular expanding Force to expand or to boil into a Gas of 2·2 density, but at the end of its burning, or when oxygenized, Sulphur has become a Gas of 2·2 density. By burning Oxygen, therefore, Sulphur has discharged great contracting power, or centripetal attraction or force. And what has become of this Force? Can it, indeed, be wholly and for ever lost?

We submit that the discharged contraction of the Sulphur while burning in Air is greatly to be found in the near liquefaction of Sulphur's close partner of the burning, the with difficulty liquefyable Oxygen of the Air. And the discharged expansion of the Oxygen is greatly to be found in the gasification of the originally solid Sulphur. The Force that contracts Oxygen, and that dilates Sulphur, in Sulphurous acid, cannot be got out of nothing, the expansion Force leaving Oxygen, and the contracting Force leaving Sulphur, cannot be extinguished. And we submit that the contracting Force and the contracted Form in Sulphur, and the expanding Force and expanded Form in Oxygen, oscillated with each other during the burning along the all-penetrating Ether, into equilibrium; and these oscillations have a certain amplitude and length and quickness, and are called Light and Heat, Chemical Action, or the Combustion of Sulphur and Oxygen; and the Force, and Form, and Character equilibrium of Oxygen, Sulphur, and the Mean, is called a Chemical Compound; in this case, sulphurous Acid Gas, which is stable, or balanced to the Earth's Shapecraft.

But Expansion and Contraction in matter are correlated to its Quintessential Form. Consequently as Sulphur has stably lost great contraction, and Oxygen great expansion by burning, both have allotropized or lost their original Forms that were correlated to the lost expansion and contraction. And as Sulphur and Oxygen, after their burning, obtain new, equalled, expansion and contraction, forces and characters, they obtain also new and equalled, or undistinguishable chord-like, allotropy-like quintessential forms and aspects from the Shapecraft, thereby becoming Sulphurous acid Gas. In this gas, in this compound, in this blending of oxygen's force, and form, and character with those of Sulphur and the Mean, we

sight, as in a chord of notes, of the original Forms of
phur and Oxygen, but not of their Actual Matter. In
phurous acid gas, I conceive that Oxygen's and Sul-
r's Matter persists, Atomy juxtaposed or marshalled to
my, and the Shapecraft's forces, its Gravities and
Spectral Force of Dayshine and Nightshine, shape and
te the Sulphur Atomy through the Forces' action and
er over the juxtaposed Oxygen Atomy; and the Shape-
ft's Forces shape and contract the Oxygen Atomy
ough the Forces' actions and power over the Sulphur
my. And if you unburthen Oxygen from the Sulphur
mies you take away the Cosmical Cold that was
difying and lowering Oxygen's capacity, dilatability,
radiation, thus enabling Oxygen to allotropize into
part and shape of Sulphurous acid. And if you un-
then the Sulphur from Oxygen Atomies, the converse
pens; and in that case the unburthened Oxygen and
phur return to their original Forces, Forms, and
racters.

CHAPTER XXXV.

CORRELATION OF FORM AND FORM PITCH WITH COSMICAL HEAT AND COLD.

THE phenomena of Chemical action, therefore, may be viewed as the Action and Reaction in matter of Heat and Cold, if we banish the idea that that alone which we feel and measure with our senses and our pocket thermometers is Heat and Cold; if we admit that in the Dayshine and in the Nightshine exist a thermal Scale and Range whose fall is Cold, whose rise is Heat; that there is always and everywhere on Earth, night and day, a Cosmical Sidereal Heat in many grades of preponderance, and a Cosmical Planetary Cold in many grades of preponderance, in constant oscillations with each other, in the Earth's all-permeating Ether and ethero molecular matter, whereby the Earth is plusly or minusly or scalariformly photothermalized, shaped, and dyed.

In the phenomena of Chemical action Gaseity and its kin Volatility stand for Plus heat and heating effects, and Solidity and its kin Solidifiability, whether in a Chemical or in the Mean earth, stand for Cold, Minus heat or cooling effects. Hydrogen, Nitrogen, Oxygen are therefore cosmically the hottest of all Earth-matter, and on the coldest of all Earth-matter, together with the ı *mineral* Earth herself. In other words, in the ɔ of the Organic elements, Hydrogen, Nitrogen, ;en, Carbon are found the greatest plus, softening, ing, gasifying, heating Powers, mated and balanced e greatest minus, hardening, contracting, solidifying, ng Powers; the Plus, however, preponderating over linus powers. And it is possible to trace the Plus Minus Agents as a strain throughout the Organic ɔounds; Carbon losing contraction or cold to the s in exchange for their expansion or heat; and the s losing expansion or heat to Carbon in exchange ts contraction or cold. And from the Heat in the gasifiability of Oxygen we obtain our daily Furnace and incessantly our breath heat. And from the greater Heat in the gasifiability of Nitrogen we get till Higher Heat of the intrinsic Flame of Life.

t each solid element needs a different amount of l heat to expand into liquidity and gaseity, or to and boil. Sulphur liquefies and gasifies, melts and with more Fire heat than Iodine. Consequently ıur does the same with Cosmical heat, or with Heat which is in Hydrogen, with that Heat ı from the Shapecraft through Hydrogen can be mitted to Sulphur or others when they are com- l or juxtaposed, Atomy to Atomy with Hydrogen. ılphuretted Hydrogen gas, therefore, a compound of ıur and Hydrogen, in which the initially solid Sulphur sified or boiled by the Cosmical Heat of the Shape- found in Sulphur's Hydrogen partner, there are two ıes of the boiler or of the cosmical fuel, or of the heat , the Hydrogen. Whereas in Hydriodic acid gas, a ound of Iodine and Hydrogen, in which the initially solid Iodine is similarly gasified or boiled by the Hydrogen, there is only one volume of the boiler or fuel or cosmical heat giving Hydrogen. For Iodine is more boilable than Sulphur, both *locally* or by *Fire*, and *cosmically* or by *Hydrogen* and the *Shapecraft's fire.*

Again, Phosphorus conducts Heat and Cold better than Sulphur or Iodine. Thermal exchanges between Phosphorus and the Mean earth, that is, heat Extraviation from acting Phosphorus to matter around, cannot be so well avoided as when badly conducting Sulphur or Iodine act. To heat Phosphorus, therefore, when combined with Hydrogen, with Hydrogen Heat, requires more Hydrogen or *Three* volumes of Hydrogen exist in Phosphoretted Hydrogen.

This relation of Sulphur, Iodine, Phosphorus, etc., to Hydrogen, or to the Cosmical Heat that Hydrogen represents, has been called Atomicity. And Atomicity in these cases is the amount of resistance to expansion, or it is the contractility, or the Force Negativeness in matter more actual, as in Iodine and Sulphur, more potential, as in Phosphorus, that has to be overcome by Cosmical Heat, in producing the new Balance of forces, forms, and characters, or the new compound Quintessential Form, the result of Chemical action and combination. On the other hand, Atomicity, on the side of Hydrogen, is the amount of expansion and expansibility that has to be overcome by Cosmical Cold or Contraction in producing the new Balance of forces, forms, and characters, or the new form, the result of chemical action and combination. In short, Atomicity signifies the amount, in negative chemical Elements, of dilatability, fusibility, volatility by the Cosmical Heat—and in positive Elements, the amount of liquefiability and solidifiability or contractility by the Cosmical Cold. Atomicity in itself, therefore, certainly exists, but has, I submit, little to do with the matter Atoms as Atoms, but much with their Character; and explains the necessity for the variation in the number of Equivalents, in each special Chemical Compound. All Elements differ in their Cosmical fusing, boiling Points, and in their Cosmical liquefying, solidifying Points, because they so differ in these Points in the Local heats or colds of the chemical Laboratory. Or, finally, Atomicity might be considered as the *Chemical* Mass in matter or the molecular attracting power between matter and matter; the most *Negative* Matter, such as Carbon, *cœteris paribus* attracting most largely the *Positive* Matters, and *vice versâ*.

In Chemical action there are always two actors—a More heated actor and a Less heated or a Cooler actor. And during action, the Heated actor gives heat to the Cooled, but only in exchange for an equal quantity of the cold actor's Cold. Or the cold actor gives to the heated Cold, but only in exchange for an equal quantity of the heated actor's Heat. Chemical action and combination therefore needs an equal Capacity for cosmical heat and cold, in all the actors and combiners. And as this equality in Thermal Capacity occurs among Chemicals only when in Equivalents, Chemical Action must always happen in Equivalents. The Equivalents, moreover, indicate the harmonious relations between the Elements in shine and form Pitches. When two or more Elements are in Equivalents they can flow and oscillate with each other into harmony. *In Music*, Harmony consists of a blending into *one* Sound of *several* Sounds, whereby the individuality of the Sounds are so commingled as to appear lost into *one* new Sound—harmony.

In Shine and Form, or in Chemistry, Harmony analogously consists in a blending into *one* Shine and Form of *several* shines and forms, whereby the individuality of the shines and forms are so commingled as to appear lost into *one* new Shine-colour and Form, as we saw happening with the Airs and Waters, and the Waters and Airs, of Earth. By Doubling the Equivalents you do not disturb Harmony, because you keep then always to the same Shine-notes in Octaves, and the harmony in octaves is the best of harmonies; neither do you disturb Harmony by going into the Sixth, Fifths, etc., of the Equivalents, for these, too, are Harmonious Proportions, but less so than the Octave; and the Sixth, etc., proportions of Equivalents therefore are less frequent in Chemistry. The form and colour Pulses of all Earth-matter are oscillating or playing in the Range and Scale of the heat of this Earth, or in the Earth's Spectral Force, and that becomes, as it were, the Standard or the Concert-pitch for the Earth. The form and colour Pitch of matter being tuned to a Concert Pitch are attuned to each other. So that the heat Capacity or the Tuning that answers in an Element, for one action or duet with one matter, answers or attunes the Element to a quartette or to an orchestra of matter, or to all the brother Pulsating Matter of the Earth; the Equivalents, therefore, suit all the Chemical Actions in which Chemicals can be engaged.

The ingredients of every Chemical Compound, however complicated it may seem, are arranged simply or binarily, the Positive Set of ingredients polarly united to the Negative Set of ingredients; it being necessary, however, to admit and to remember that the Earth Globe itself is our Greatest Chemical, and not always to be ignored or to be taken as as Underling actor in Chemistry, but that the

Globe sometimes acts as a very efficient Negative or form Contractor in the Form of chemical compounds. The Quintessential Forms in matter, whether it be homogeneous or elemental matter, or whether it be unhomogeneous or compound matter, are, I submit, in every case, composite, like the Forces in a bar Magnet, like the Forces in the Spectrum bar, like the *Amber Forces* or Electricity, like the Forces of Heat and Cold, like Bass and Treble, like Male and Female. The Form is binarily polarly built up, and binarily kept together, by an oscillating balance of Two Forces, one of which is Planetary or Cold, or form Contracting or Centripetal motion, and the other Sidereal or Heat, or form Expanding or Centrifugal motion.

And although Water or Steam is made out of two volumes of Hydrogen to one of Oxygen, still Steam, when actually formed, is not composed of three volumes of its ingredients, but of two. The three volumes become two volumes, because in the combination of Hydrogen and Oxygen there is a Balanced or Harmonious Equality of pulsations and forms between them. The Odd volumes in combining gases are, as a rule, made Evens in combination, because the combiners in evens pulsate in unison or unishine, or in the most perfect, and therefore most preferable, harmony of form and colour Pulsation.

In a Chemical Form, whether simple or compound, there is always a Negative and a Positive power in shaping action. When the form is simple, or homogeneous, or elemental, the Plus and Minus Forces of the Shapecraft still find their way into the form, by matter's Character; no Contracted element, therefore, lacks some degree of Expansion from the Shapecraft; no Expanded element lacks some degree of Contraction. If the Force in elemental forms were single, their matter would be dissipated by the pure Expanding force, an approach to which is observed in the matter of Perihelion Comets; or, on the other hand, the Universe itself might be contracted to a spot by a pure, unopposed Contracting force. When the Form is compound it is always made from ingredients with the positive and negative Strains—ingredients which themselves give ready entrance and action to the opposite analogous Forces in the Shapecraft. And it is always possible to group the ingredients of compounds into Negative and Positive Sets, particularly if the mean Earth be taken for our greatest Negative Chemical.

CHAPTER XXXVI.

ACTION BETWEEN OXYGEN AND METAL.

Oxygen is pergaseous, very expanded, and cosmically heated, but liquefiable and solidifiable by Local Cold, and abounds in almost all the Range of the forces and forms of this Earth globe, the whole World being more than half made of Oxygen. Hence Oxygen is easily ozonifiable or made Dark radiant, specially in contact with conducting brother Earth-makers, that is, with suitable Metals. And although the native sky Oxygen has a very high Force and Form, or is Gaseous and highly plus-charged with Dayshine and Nightshine, still it has, if in company with Metals, every potential for taking the Lower and the Lowest forces and forms, or the Minus charges of Dayshine or the Mean earth's Cosmical cold and solidity.

For the Metals, Rubidium, Potassium, Sodium, Lithium, Calcium, with which Oxygen most readily directly combines, are solids that are light, expansible, fusible, and volatile, and conducting, and these Metals, therefore, have Reciprocities of force and form both towards the Oxygen and the Mean earth; and thus these Metals are good force and form Intermediaries between Sky Oxygen and the solid Mean earth. They can rise towards the Oxygen, and fall towards the Earth. Between the Solidity of the metals and the Gaseity of the oxygen there exists great morphigenic thermal force Disequilibrium, and thereby the selective, electric-like Attraction between the Atomies of the Metals and those of Oxygen, whereby the negative, Solid Atomies of the Metals are marshalled against the positive, gaseous Atomies of the Oxygen, Atomies to Atomies. But besides their mutual force and form Disequilibrium there exists for Oxygen and Metal another similar but stronger force and form Disequilibrium between them and the Mean of Terrestrial morphigenic thermal forces or the Mean earth. And between the Mean earth on the one hand and Oxygen and the positive Metals on the other there is an impulse to reciprocating force and form Dislocation, and their oscillatory Passage and Exchange and final Re-equilibration, the Oxygen and Metals dislocating Meanwards positive force and form, and the Mean earth dislocating Metal-and-Oxygen-ward negative force and form, in oscillations, along the all-permeating Ether. The ethereal expansion motion originates from the Oxygen and Metal, and the recoil ethereal motions that convert these expanding ethereal motions into the Oscillations called Heat and Light, originate chiefly in the Mean earth. In other words, in the combination of Oxygen and Metal, in Oxymetallic burnings, the Oxygen and Metal are greatly cooled and contracted by the Mean earth's Cold and Contraction, and the Mean earth is in her turn warmed and expanded by the Oxymetallic Heat and Expansion in proportion to the quantities and qualities of the burning Metals.

Oxygen, in selective, electric-like attraction and contact with these Metals, has a double force and form Discharging Impulse, both acting or pulling on Oxygen in the same direction. Oxygen's first impulse is towards the Metal, and the second is through the conducting Metal towards the Mean earth, and this Double Impulse in Oxygen meets in the positive Metal a Third similar Impulse Meanwards, and as these Three Impulses are acting or pulling in the same direction and meeting complete Reciprocity from each other they strengthen each other; and as there exists also force and form oscillatory Reciprocity between Oxygen, Metal and the Mean earth, there is very intensified impulses and perfect acting Powers urging on and producing Action or force and form dislocation, passage, and exchange, in oscillations, between Heated and Gaseous Oxygen, Less heated but still Volatile Metal, and Least heated, or Contracted and Cooled, very Solid Mean earth. Such Metals are said, therefore, to have great *affinity* to Oxygen.

The Metals are said to burn, which means that the forces and forms of Oxygen and Metal on the one hand and those of the Mean earth on the other are bandied to and fro from one Set of actors to the Other. The two Sets of actors first oscillate in certain amplitudes and pitches of Spectral Force, and are finally settled into new force and form and character Equilibrium. And as these oscillations occur amid the all-permeating Elastic Ether they are taken up and conveyed to the Eye-brain and nerve Centres by the Ether, and perceived as Light and Heat; just as Air takes up the oscillations of sounding Church Bells or Harp Strings and conveys them to the Ear-brain as Sound and Music.

If we keep to the old ideas and phraseology of the Thermal Force or Heat we might affirm that as the Metal, say, the solid but volatile Calcium, and the gaseous Oxygen, acting or burning together persolidify, they must then discharge a vast amount of Latent Heat, namely, that of a high Oxygenic Gaseity and that of a Calcic Volatility, both *ultimately* resolvable into Dayshine and Nightshine, stored in Oxygen and Calcium through Character; and this Heat Discharge passes into the Mean Morphigenic Thermal Forces of the Earth or into the Mean earth, whence passes to the burning, oxydizing Metals, to contract them, part of the enormous, planetary, contracting, persolidifying Force that solidifies the Mean earth. In gaseous Oxygen exists an expansion Force of more than a Thousand Atmospheres' pressure power—an enormous force—correlated to Oxygen's Gaseity, and that Gaseity is correlated to the old Latent Heat—an Oxygenic gaseous latent force that must, therefore, escape when Oxygen suddenly persolidifies, as Oxygen does when it burns with Calcium and other positive Metals; a Latent Heat traceable to the plus Dayshine or Nightshine Fire, to which Oxygen is freely, constantly exposed, and by Character amenable.

In Metallic Burnings pergaseous and volatile Oxymetallic matter, by cosmical radiation, conduction and reciprocities, are suddenly cooled and contracted by the very powerful action of the Mean earth, and then we see appearing their Latent Heat and Light, which are in ultimates guises of the Dayshine and Nightshine; and at the same time there passes from the Mean earth to the Burning Metals, to contract them, part of that enormous Force that knits the whole Earth Globe into its present Mean solid form; for we must never forget that in burning, oxydizing Calcium, if we obtain an enormous expanding Force or Plus heat and light, it is because as intense a contracting force or Minus heat and light or Cold and Shade has entered the burners. They are enormously contracted, however, only because the Mean Earth is thereby enormously expanded, and the Force that contracts is certainly as much Force as that which expands; and the one Force, indeed, it is that keeps the other in Earth-matter and Ether always in some check, or in balance.

In the burning of Oxygen and Calcium, therefore, and other positive Metals there has been no new, local, clashing Creation of Force, or of Light and Heat, and far less their Extinction. What has occurred is a simple dislocation and oscillatory passage and exchange of plus and minus Morphigenic Thermal Forces between the plus Local Burners and the minus unobtrusive Mean earth; and what form and force the Plus gained the Minus lost, and what form and force the Minus lost the Plus gained. The Mean earth is always heated, expanded, burnt, whenever Positive Metals act or contract or burn with Oxygen, but this heating and expansion of the Earth is very insignificant and unobtrusive in the Small, Local metallic burnings of Man's Promptings. But when vast Masses of the Cosmical metal Hydrogen burn with vast Masses of Cosmical Oxygen, in Dayshine and Nightshine, then we perceive easily the Earth's Mean force and form expanded and heated by her softened Soils and dissolved Solids, by her widespread Waters, by her deep Oceans, and by her cloudy and moist Atmosphere.

CHAPTER XXXVII.

ACTION BETWEEN OXYGEN AND HYDROGEN.

FREE Hydrogen and free Oxygen singly or unmixed with each other are at great force and form Disequilibrium with the Mean of themselves, and of the General Earth. For Free Oxygen and Hydrogen are light and nearly unliquifiably Gaseous, much expanded and Cosmically heated, very force positive Elements, while the Mean force and form of the rest of the Hydrogen on Earth is negative or cooled and watery, and the Mean force and form of the rest of the Oxygen of the Earth is still more negative, or is most cooled and solid, and the Mean earth is also solid and negative or planetary. Singly, however, these pergaseous Elements, though very force and form Disequilibrized to their own Mean and that of the General Earth, do not force and form equilibrize with them, because there are insufficiencies in the Character of the Gases as singles that hinder the Equilibrium taking. Hydrogen lacking greater Weight or Pressure and Darker radiation, and Oxygen lacking greater Conductivity, and both, also, when single lacking force and form Reciprocity to their own Mean and that of the Earth. If, however, you mix the Two gases their

Morphigenic Thermal Forces differ quite enough to produce between them the Selective, Electric-like Attraction that juxtaposes their Atomies; and then by the reciprocal induction and blending of their Characters, conducting Hydrogen furnishes to the blending conductivity, and the heavier ozonifiable Oxygen weight pressure and Darker radiation, and the mixed and blended gases have also perfect force and form Reciprocity to their own Means and to that of the Earth, since they together as the Waters make up a large portion of the Earth; and their Disequilibrium to their own Means and to that of the Earth still persists in the Mixed Gases but now with the potentials in them of complete Equilibration with those Means; or with the powers for dislocation, passage, and exchange of the Plus and Minus forces and forms between them and the Mean earth. Mixed Oxygen and Hydrogen, therefore, can burn most intensely, or can oscillate in force and form with the Mean earth in the Widest of wave amplitudes. For in this burning *very high* (Gaseity), that of the gases, and *very intense* Solidity, that of the Mean earth, are exchanged for the Liquidity of the Waters of the Earth. Between the pergaseous burning Gases and the persolid burnt Mean earth, the form and force Gap is very large, and the force and form Oscillations, therefore, between the Burners and the Burnt can be equally large also, or the heat is very vivid or intense during the Wide oscillations that in this action convert pergaseity on the one hand and persolidity on the other into the liquidity of the Waters round the Earth globe. This action, or burning, or combination, is exhaustive, violent, stable, because the Two Sets of actors are, in their respective Forces and Forms, the very strongest that can directly act or combine on Earth.

The Mean earth is the most Solid and Solidifying of Chemicals, and the mixed Gases the most Gaseous and Gasifying of Chemicals, and the result of their union is their Mean of the Waters of the Earth. The Affinity in this combination is not so much between the actual Oxygen and Hydrogen as between them and the Mean earth; for the Mean earth can shunt the mixed Gases from the preponderance of the Sidereal shine powers to her Own. There are Forces in the Earth that can liquefy, not only Drops, but Oceans, not only Grains, but Tons on Tons of this gaseous blended mixture of Oxygen and Hydrogen. The same Forces that act on the Water-Drop act on the Oceans, for the tiniest Dew Drop counts kin to the vastest Ocean, and Both are cherished equally by Nature.

In other words, when Oxygen and Hydrogen burn, from the Mean earth, low-pitched Spectral Force, cosmical Minus heat or Cold, or Minus electricity, Form contracting power, force Negativeness can pass or be conducted and radiated into the Mixture of the character-blended Gases, Oxygen and Hydrogen, to the extent of Thousands of Atmospheres' contracting freezing powers, while from the two Gases an equivalent and equal counter force of Plus heat or of form Expanding power, High-pitched Spectral Force, Plus electricity, force Positiveness can pass or be radiated and conducted into the Negative Mean earth, and thereby the two Gases, Oxygen and Hydrogen, that were highly heated and gaseous, cool, contract, liquefy, or become Water, that is, approach Solidity, which is the Earth's Mean form and force; and the Earth's Mean form and force that are solid become softened and surrounded by her large, deep Waters and steamy cloudy Atmosphere, the Earth's form thus expanding, liquefying, volatilizing and approaching Gaseity, which is the form of the mixed Gases. Plus and Minus force and form are, therefore, exchanged and shared between the Mean earth and the mixed Gases when vast or the native cosmical quantities of Oxygen and Hydrogen are burnt in Dayshine and Nightshine. This is, therefore, not a Local combination alone, but also a combination of Hydrogen and Oxygen on the one hand, and the Mean earth on the other; and in it there has been no Creation of force or form nor their Extinction, but a simple force and form Oscillation in Ether and in ethero matter of the Widest Amplitude or of High and Intense pitches, or a dislocation, passage and exchange of equal amounts of plus and minus morphigenic thermal forces between the character-blended Gases, Hydrogen and Oxygen, and the Mean earth; or in Ultimates between the Sun on the one hand, and the Earth on the other. The expansion and heatedness that the two Gases lost by combining and liquefying, the Mean solid form of that large Chemical, the Earth, gained by approaching more to the Liquid Form at the expense of the Gases' loss, or at the expense of what ultimately backs the expansions of the gases on Earth, the Sunshine Power or the Sun and Stars themselves. The contraction that the Mean solid form of the Earth lost, the mixed combining Gases, that is, the Sun himself and the Stars, ultimately gained, in rapid and constant Oscillations.

Simply mixed, however, Hydrogen and Oxygen do not at once unite, that is, do not contract or liquefy into Water through the contracting, cooling powers of the Mean of the Morphigenic Thermal Forces of the Earth, that is, by the mean gravity and bass-like Spectral Forces of the Earth-globe, because the Mean's contracting powers are acting upon Gaseous matter on which the Cosmical heating and expanding powers, the Sun and Star powers in the Shapecraft have such very strong effects that retain the expanded Force and Form in the Gases. But we increase the cooling form-contracting power of the Mean earth on the mixed Gases if we touch them with elements that have a similar Negative Force and Form and Character to the Mean earth, or that are Mean earth Analogues; and Platinum is such an Element. Platinum may actually touch closely the Gases, and Platinum is solid, heavy, conductive, Dark radiant, and badly fusible, or very Force Negative and attracts the Gases; and Platinum thus represents to the Miniature matter of the mixed Gases a Miniature Mean earth, but a heavier, solider, nearer, attracting, touching, more conducting and radiating Earth—a second better, intermediary, Mean earth. Consequently the Touch of Platinum on the Gases increases on them two-fold by the form Contracting, the force Cooling, the weight pressure or the action which the Mean earth herself also exercises on the Gases—and this casting Touch from Platinum starts the Chemical Action of the mixed Gases. And Platinum by its nearness, greater negativeness, greater attraction, conduction and radiation, *out-radiates* or *out-conducts*, *out-bids* the actual or veritable Mean earth, for the plus expansion Forces or the plus heatedness of the combining Gases. Platinum's Touch not only makes the two Gases combine, but as long as the Platinum is present *it* becomes red hot, while the *Gases themselves* are combining quietly, heatlessly or coldly—for the Platinum it is that is the Receiver of the plus heat or expansion of the action; the Gases, on their side, are the Receivers of the *Cold* or *Contraction* of the action.

And it is clear also that both the actual Mean earth and the Platinum, as a Mean earth Analogue, contract, cool, liquefy gaseous Oxygen and Hydrogen, because both the Earth and Platinum are negatives, solid, contracted, Cosmically Cooled Bodies. And if the Mean Earth or the Platinum were white hot, they would no longer serve to contract the Oxygen and the Hydrogen or to convert them into liquids; the Earth's and Platinum's powers to liquefy the Gases being dependent on cooledness will be lost or reversed if you make the Earth or Platinum white hot. This is impossible with the actual Mean Earth, but quite possible with Platinum. And if we touch water with white hot Platinum, water is decomposed; for in that case water is no longer in contact with a Cold Mean Earth, but with a white hot Analogue of one, or with a virtual plus Sun that has the power not to liquefy the Gases, but to gasify them.

CHAPTER XXXVIII.

ACTION BETWEEN CHLORINE OR THE HALOGENS AND HYDROGEN.

AT common Temperatures there is an expansion power in gaseous Hydrogen's Morphigenic Thermal Force of more than a Thousand Atmospheres. For more than this pressure has been put on Hydrogen, without liquefying it. And if you mix this gaseous Hydrogen with the gas Chlorine in which there is an analogous power of only Five Atmospheres, you shall have two very disequilibrized, or very plus and minus gaseous, Morphigenic Thermal Forces between these touching gases, acting and reacting on each other, and producing the plus and minus electric-like, selective Attraction or Diffusion between them—and likewise the impulse in the plus Actor, Hydrogen, to heat or expand the minus Actor, Chlorine, and the reciprocating impulse in the Chlorine to cool or contract the Hydrogen. But the mixed Gases are not only in touch with each other, but also with the Mean earth, and have thereto great force and form Disequilibrium, and hereby the Force and Form equilibrizing Impulse. But or this force and form Equilibration with the Mean, here is in the mixed, character blended Gases no dark or meanward *Radiation,* but only the meanward *Conduction* of the Hydrogen, and Hydrogen's force and form Reciprocity with the Mean earth—for Hydrogen participates freely in the Mean earth's form and force by being part of her abounding omnipresent Waters. In the combination of Hydrogen with Chlorine or in the formation of Hydrochloric Acid, there being a lack of dark or meanward radiation in the local combiners, the Mean earth takes part more partially than in the combination of Hydrogen with Oxygen, or in the formation of Water. And a part of the expanding Force of the Hydrogen is held back, in this action, from the Mean, or is retained in the bad conducting and bad dark radiating Chlorine, and consequently lightens and expands Chlorine in Hydrochloric Acid, from a gas of 5 Atmospheres' into a gas of 40 Atmospheres' expanding power. In the combination of Hydrogen with Chlorine, or more generally of Hydrogen with the Halogens, in Hydrohalogenic Actions, the greater force and form Disequiibrium lies with the Hydrogen, and in Hydrogen lies also the meanward Conduction, and the meanward form and force Reciprocity; consequently it is between Hydrogen and the Mean that the greatest force and form Exchanges occur. And in Hydrohalogenic Actions we have the ightest and most unliquefiable of Gases, the Hydrogen becoming comparatively heavy and easily liquefiable, that is, becoming much contracted, at the expense partly of the Halogens, but mostly of the Mean earth, or the Mean of terrestrial Morphigenic Thermal Forces. In other words, when an Hydrohalogenic Acid is formed, both from the Halogens and most from the Mean, contracting Force and Form pass Hydrogenwards, while the oscillating counter Force and Form of great expansion is passing from the

Hydrogen Chlorineward or Halogenward and Meanward. In the Hydrohalogenic actions there has been no clashing Creation of new Heat and Light force, and far less its Extinction. There has been only a dislocation, oscillatory passage and exchange, and re-equilibration of a Plus and a Minus Morphigenic Thermal Force of more than a thousand Atmospheres' expanding and contracting power, between one equivalent of Hydrogen, on the one hand, and one equivalent of Chlorine and of the Mean earth, on the other. These equivalents of plus and minus Morphigenic Thermal Forces, before the Hydrohalogenic Action, existed each statically balanced in the equivalent of the Hydrogen and of the Chlorine and of the Mean; and after the action, all these equivalents exist as much as ever, they have not been lost but shunted into other lines or directions, and are thereby only otherwise distributed, over different quantities and qualities of matter; and these Forces or Motions cannot, therefore, oscillate Morphigenically or Photothermally in their new abodes as they did in the old. In other words, through a different distribution of forces, new force effects, or matter Allotropies arise, or a seemingly New Substance, with a Hydrohalogenic Aspect appears. And this Matter is composed of the ingredients that have the Force, the Form, the Character in their collective group, the most typical of Acidity. The original Halogens themselves and their union with Hydrogen, forming matter that most agrees with the average matter that makes the Radicle of acids.

In this action, One volume of gaseous Hydrogen and an Equal volume of gaseous Chlorine, combine, and after combination, both retain the Same volume—or rather, the bulk of the compound or of the Hydrochloric Gas, resulting from the action, is twice the bulk of either of the free combining gases. It is stated, therefore, that the two gases, Hydrogen and Chlorine, combine together into Hydrochloric acid gas, without *any* condensation. But Chlorine in Hydrochloric Acid is lighter and less liquefiable than Chlorine free; and Hydrogen in Hydrochloric Acid is much heavier and much more liquefiable than Hydrogen free. Consequently there has been great change in the expanding powers of Hydrogen and in the contracting powers of Chlorine by their combination.

Chlorine being lighter and less liquefiable in Hydrochloric Acid, has there lost contracting power, and gained expansion. Hydrogen being heavier and much more liquefiable in Hydrochloric Acid, has there gained contracting power, and lost expansion. But Chlorine has not expanded to anything like the amount to which Hydrogen has contracted, because in this action, the Mean earth mingles, and also expands, by tapping through Hydrogen's conductivity and character Reciprocity earthwards, the plus heat or the expansion force of the action or of Hydrogen. In Hydrochloric Acid gas, one set of ingredients, the Mean earth and the Chlorine, oscillatorily dilate, and together compensate the great contraction in the Hydrogen or of the other ingredient; the expansion of the vast Mean earth being in these small actions, necessarily to a very diluted or unobtrusive degree.

But solid Iodine and liquid Bromine, Halogens with analogous characters to Chlorine, during analogous combinations, with analogous equivalent quantity of Hydrogen, more visibly or strikingly dilate. The solid Iodine, in combining with one equivalent of Hydrogen, dilates, for the solid gasifies or expands into the gaseous state, as

Hydriodic Acid; and the liquid Halogen, Bromine, in a like case, dilates or gasifies or expands into the gaseous state, as Hydrobromic Acid. In combining with Hydrogen, the dilatation of the Iodine is obtrusively marked; for in the combination a Solid expands to a Vapour or a Gas; with Bromine, in a like case, Liquidity expands into a Vapour or Gas. I submit that the analogous expansion occurs in Chlorine also, only a little more unobtrusively, because Chlorine being already Gaseous, can by combination with Hydrogen dilate only by a rise in the Gaseity pitch, that is, by becoming lighter and more difficult to liquefy; and this Chlorine actually does in becoming Hydrochloric Acid.

CHAPTER XXXIX.

RECAPITULATIONS.

We recapitulate. When Oxygen burns a Metal and a Metal Oxygen, in oxymetallic burnings, the Photothermal Phenomena, and the Matter-transformations, the change of form and force of the compounded Oxygen and Metal, or the ashes of the burnings, may puzzle Theory if we do not remember that the burning Metal and Oxygen conduct and radiate and reciprocate in Force and Form with their Mean integral earth, and thereby doubly appropriate the forces and forms of the Mean earth; so that in the Oxymetallic burnings the chemical phenomena are least confined to the Small Quantity of burners and to the Small Laboratory of the burning. An oxidizing, burning Metal burns or heats the vast Mean earth; and to heat so large a space, both the Metal and the Oxygen must cool and contract proportionably. Hence, when a Metal, say Hydrogen or Calcium, burns with Oxygen, it greatly cools or contracts in force and form; for the pergaseous Hydrogen in burning in pergaseous Air liquefies into easily solidifiable Water—and solid but fusible Calcium burns into the more contracted or infusible pitch of solidity called Lime, or the Oxide ashes of Calcium. And the Cold or the intense Contraction of the Burners is as inseparably entwined or correlated to all their burnings, as the Heat or Fire is—but the *Cosmical Cold* being most modest or unobtrusive has hitherto escaped study or even mention. Howbeit when the Cosmical Hydrogen of the Earth-globe first burned with its fellow Oxygen of the Earth, they made a mighty conflagration which burnt or expanded the Mean earth—and Cold and Contraction, the negative Force and Form, from the Mean earth, liquefied the Gases or oscillated with heat and expansion, the positive Force and Form from Hydrogen and Oxygen, or from the Mean Sun and Star Suns; and these planetary or negative and these sidereal or positive forces still continue to this hour to oscillate with each other, on the Earth and Solar System, and indeed in the Universe.

In the action between Hydrogen and Oxygen, there are two intensely gaseous Elements; Gaseity indicating in its possessor great expanding Force, and expanding Force being correlated to Plus heat and light, which in its turn is derived mediately or immediately from plus Dayshines or the preponderance of Sidereal shine powers, in the matter of the Earth. In the action between Hydrogen and Oxygen what first strikes us, is a pale or an unobtrusive Blue Flame, which we find, however, to be the *hottest* on Earth, or in which is contained *the most expanding Force;* nor is it at all strange that the greatest expansion Force should proceed from the most expanded matter while greatly contracting. We accordingly perceive that as the expanding Force or Flame appears on the Gases, the expansion itself in the Gases disappears from them, or they liquefy or contract into Water. The expansion Force therefore was, as it were, expelled and substituted by a contraction Force in the gases, and this contraction Force must be great, for it has expelled much expansive Force in the gases, and it is indeed derived from a large strong source—the diminished weight and contraction of the whole Earth, which is lightened, softened, liquefied, gasified through the Sidereal shine power, by the presence in her matter of large amounts of Oxygen and Hydrogen. The Expansion Force from the Pale Blue Flame of these Burners is not therefore lost, though it seems to disappear, for it is seen if large enough, to Dilate a Whole World; nor is the contracting Force that the Earth discharged or lost, wholly lost, for it not only contracts the Gases, but through them, it contracts the Sun and Stars. And these oscillations of Contraction and Expansion between the Earth on the one hand, and the Sun and Stars on the other, go on cyclically for ever, and it is the Aggregations of many such Oscillations that make all the Shines of the Universe.

In Oxymetallic combustions therefore, much Heat or Expanding molecular force leaves the burners and their laboratories and travels far—and much Cosmical Cold or much, also far travelled, Contracting force, quite unannounced and hitherto *incognito*, enters the Laboratory and does much valid work there for the Oxymetallic Burners. In these burnings, therefore, we have our strongest and our farthest coming and going Cold and Heat forces. That is, we have Heat and Cold in such a perfect *cosmical condition* that they can assume the Galvanic phase or guise. But even because these phenomena are quite capable of a Galvanic development, we are bound to have in them as much Plus heat as Minus heat or Cold, and as much Cold as Heat; for no metallic combustion, no chemical, no electric Action, no Fire whatever on Earth or Universe, is one-sided. Fire, or Heat and Light, and also Form and Form pitch, are Ethereal and Ethero Molecular Oscillations and result from Two force currents that meet each other in Oscillations in Ether and ethero matter, in the Newtonian fits of easy transmission or advance, and easy reflexion or recoil, balancing each other in Ether as sensible Light and Heat and their Correlates, and balancing each other in actual ethero molecular Matter, or latent in the molecular form and colour Pulse of chemicals. The conception of the Cosmical Heat and Cold forces throws light on the plus and minus Electric forces; and the Electric forces, in their turn, throw light on the Cosmical Heat and Cold forces, and the two Forces of heat and of electricity throw light on the shaping or the Chemical Forces on the Earth by means of their strict correlations. Viewed in the Electric aspect, there is little difficulty in conceiving that in the Metalloidation of Metals, and specially when Oxygen is the Metalloidizer, the Mean earth takes part, takes the plus Spark, or is burnt, or acts as a Reservoir, or a cooler and form contractor of Metalloidizers, and thereby bestows on them a good share of her Mean force, and form and character, greatly Earthifies them, or reduces them into Earth-like adusted ashes. And this the Mean earth does in a very exhaustive way by her Vastness—for she is in truth our Largest Chemical. And this the Mean earth does also in virtue of her Mean photothermal capacity, radiation, conductivity, and weight. But as a Mean Chemical the Earth is not very light, or very capacious, or very plastic,—much less so, it is probable, than her fellow exterior Planets of the Solar system.

Consequently, the Mean mineral earth's chemical actions or her matter-shaping powers are limited. In Morphigenesis the Mean earth acts form contractively in an exhaustive, violent, permanent way, and produces ready, direct, fixed, very Metamorphic Heterogenesis in her fellow actors, but not great Polygenesis by her actions. The fuller powers of Polygenesis in matter, the powers of negatively helping to make Many Quintessential Forms—God has bestowed on the much more heat capacious, plastic, multiradiant and lighter Carbon. Carbon forms a minor earth in the larger earth. Carbon is chosen for the Prolific Earth, for the Mother Part, for the Negative Groundwork, for the Negative Force, in the more beauteous and varied shapes and dyes of the Organic part of the Planet earth.

Combustion, like any other chemical action, consists of a dislocation, passage, and exchange, and re-equilibration between Two Sets of actors, of their plus and minus Morphigenic Thermal Forces; consists of Oscillations propagated in Ether between the forces and forms of Two Sets of matter, one Set having the negative or recoil force and form and the other Set having the positive or advancing force and form. And these Oscillations I conceive to be analogous to the Oscillations in grosser and rarer matters that produce sound. In the Sound oscillations we have the Pitch or the quickness of the pulses, and we have their Amplitudes, or widths, the widest amplitudes giving the greatest distinctness or loudness or intensity of sound. In heat and light Pulses I conceive that there are analogous phenomena. And with the greatest Amplitudes of ethero molecular form and force Pulsation we shall have the Intensest heat and the Potentials of the Intensest light. To make the most Intense combustion, therefore, we must have great Heatedness or Expansion or Gaseity in the positive burners, and quite as great a Cooledness or Contraction or Solidity in the negative burners—ready and able to Oscillate in force and form; and in such a case these Oscillations would be of the amplest widths, or of the Intensest heat and potentially of Light also; and this happens specially when Oxygen and Hydrogen burn on the Earth.

CHAPTER XL.

WHENCE THE HEAT AND LIGHT OF COMBUSTION?

In the Earth-globe floods of Sidereal and Planetary shine powers are constantly meeting in Ether and in Ethero Molecular Matter, and oscillating with each other—first in the Oxynitrous Air, then in the Carbonic acid Air, and in the Water Air or Vapour, then in the Land Waters, then in Flora and Fauna, and finally in the very Lands themselves. And *in* these and *by* these ethereal and ethero molecular oscillations and the gravities arise the Morphigenic Thermal Force of matter, arise the Life, the Joy, the Light, the Heat, the Forms, and the coloured Loveliness of the landscapes of Earth. Those are the oscillations that produce the routine phenomena around us, and they will never forsake the Earth-globe for a moment as long as there are in creation plus and minus shining Suns and Planets, plus and minus ethero molecular matter, and plus and minus Characters in that matter. There is, therefore, no lack of Morphigenic Thermal Force or of Shine Powers on Earth at no time, or place, or thing; for all peripheral Earth-Matter is virtually shining, day and night and everywhere, and each with its special form and force or pitch of Shine. The

Earth's sky air ocean, encasing the entire globe, shines best, or in the brightest and highest Cosmical Light and Heat pitches. The dark depths of the Earth's crust shine worst, or in the blackest, lowest Cosmical Light and Heat, or in the Cosmical Cold and Shade. In the sky air these ethereal and ethero molecular oscillations are the shortest and quickest, and the sky matter of the Earth is bright and gaseous. In the Earth's crust the pulsations are longest and slowest, and the crust matter of the Earth is dark and solid. Carbon, therefore, while in the depths of the Earth's crust is subjected to the strongest, darkest, and most solidifying Shine Powers of the Earth, to which Carbon is sensitive, and Carbon in the Mine is, therefore, gradually petrified into Coal. So from the Mine we dig out a Carbon that is sunk or petrified into a sooty persolidity, sunk into the Lowest Depths of Force and Form, Carbon's Shine Powers being in black or abeyance, like a Spring compressed. But though such Carbon is black or Shine and Form sunk, still it never ceases to be Kin to all Carbon, Kin even to that Carbon which helps to read, which helps to indite, these lines; a Carbon that though sunken is ready, is eager—able and willing—to take the Highest Forms with suitable mates. On the other hand, the Oxygen in the sky takes the pergaseous form, and has risen to the Highest Shine Powers on Earth. But from these form and shine Heights, Oxygen is ever ready and eager to fall, and has, indeed, constantly fallen, or has even been, mayhap, a whilom Carbonic-Acid-partner of that very Carbon which we dig from the pit or mine. In other words both Oxygen and Carbon have a very remarkably Wide Range of oscillations in Force and Form. But Carbon oscillates from the Lowest force and form to the Highest, or from persolidity to pergaseity; while Oxygen oscillates from the Highest force and form downwards to the Lowest, from pergaseity to persolidity. Carbon single always sinks in Force and Form, and must be helped in combination by suitable Others to rise; Oxygen single always rises in Force and Form, and must be helped in combination by suitable Others to fall. Oxygen and Carbon, therefore, brought together can easily become force and form-oscillation partners; the two have in highest degree the mutual force, form, and character Reciprocity. Oxygen can fall in the direction of Carbon's rises, Carbon can rise in the direction of Oxygen's falls—the two can act in see-saws, or can oscillate in Force and Form, most widely and perfectly together amid their correlatively oscillating Ether, giving us thereby proportionally intense Heat and Light and Transformation; hence the persolidity of Carbon when oscillating or combining with Oxygen rises up to gaseity in Carbonic Acid, and the pergaseity of Oxygen when oscillating or combining with Carbon sinks to the brink of liquefaction in the Carbonic Acid.

Amid the routine and manifold Chemicals of our surrounding landscapes, few while acting chemically can oscillate in Force and Form so widely, so easily, so perfectly, as free Carbon and free Oxygen together can. Consequently in none of the routine, unceasing, natural chemical actions or Oscillations or transformations or shinings of our surroundings do we note so intense a light, so intense a heat, so wide a transformation, as when free Carbon and Oxygen act. Although the action of the Commonality, the routine, Oscillations also assuredly give us light and heat and transformations, still the transformations are narrower and the heat and light colder and shadier, and by our equilibration and by our familiarity with them quite unobtrusive to us, compared with the Oxygen and Carbon action or Oscillation or shining or burning. But even the routine, the unceasing shines or Oscillations in the commoner ethero matter, shunted from the lines of the Commonality around into the lines of Carbon's and Oxygen's ethero Atomies—even these common Oscillations rise at once in pitch and amplitude in those Oxycarbon lines and awake similar Oscillations in Ether, and develop thereby what corresponds to be the loud in sound or develop *combustion* light and heat and transformation in Carbon and Oxygen; and Carbon is then said to take fire and burn.

Place the very contracted Atomies of Carbon and the very expanded Atomies of Oxygen together, night or day, anywhere, in the closely-packed pulsating Plenum of the ethero molecular matter of the Earth, and the Atomies of Carbon and Oxygen will attract each other selectively, will dovetail in marshalled lines; and in such a position, the Oxygen expansion tends to oscillate *greatly* with the Carbon contraction, and *vice versâ:* and we have therefore between the Carbon and Oxygen more potentials for *very wide, easy* force and form Oscillations, and consequently for the louder like or for the more vivid and higher, or for the *combustion* pitch of heat and light and transformation than in any neighbouring matter around.

But on free Carbon a very strong contracting Force is pressing and hindering Carbon's expansions or Oscillation towards its touching Oxygen, which Force, however, is eased off by heating Carbon; and then the heated Carbon and the Oxygen begin forthwith to act, to Oscillate, to transform, backed or kindled by the ever present Planetary and Sidereal Oscillations that flood all things around them. In common speech Carbon is said to catch fire, but this is not the whole truth, for while Carbon takes the Hot part of fire, the Oxygen takes the Cold part of fire also, the two, the Carbon and the Oxygen, both take each its special fire, that is, both are molecularly Oscillating in Force, in Form, in Character, with each other, and their reciprocal Oscillations being very easy, wide and accelerated, and occurring amid pulsatile Ethers, are copied by the Ether, and in Ether transmitted to Man and others, as Heat and Light—in analogy to the Oscillations of tuned strings or bells, which, in wider amplitudes and higher pitches, transmitted to pulsatile airs, give to Man the sounds of music with greater loudness and shrillness.

When free Carbon burns in Air, an unwonted Break occurs in the circuit of linked Oscillatory Forces or Shine powers, floods of which are always, as a matter of course, oscillating through the Earth's peripheral Ether and ethero molecular matter, as the actual Dayshine and Nightshine, and as the routine formations and transformations or chemical transactions of the World's Being. And in burning free Carbon, we have shunted into the line of Carbon, trains of the currents of the Dayshine and Nightshine always flowing over the Earth's Ether and ethero matter—currents therefore that might have flowed into Cloud, Water, Fauna, Flora—currents that when so flowing give them their shapes, dyes, motions, life, and loveliness. Consequently we have not created new Force or Form in burning Carbon in air—nay, with more reason might we be said to have wasted Force, or used up as Fire a Force that might have been better employed in higher tasks; a Force that might have gone into the peripheral Earth-matter and have shaped it, dyed it, vivified it and beautified it.

In burning Carbon, we expand its intense Solidity, we expand an intense contracting or negative Force, at one sweep, up to the very high dilatation of a Carbonic acid Gaseity—and this Carbonic contracting Force is valuable for shaping matter negatively. And this contracting Carbon Force is indeed actually so utilized in a homologous scale in the shaping of the Organic Compounds. A long series of narrow Forms is possible between the contracted Solidity of free Carbon, and the Gaseity of air burnt Carbon. But in burning Carbon this negative Force is wasted; for only one very Wide transformation or the Carbonic acid Form, is alone produced in the Carbon, instead of a multitude of Narrower Forms as in Organic Chemistry; and we have thereby in burning Carbon, force and form Oscillations of wide amplitudes and high pitches, we have thereby fierce Fire Heat; but only because we sacrifice or burn up, great negative form-making Power in Carbon, as the price of the Fire. In burning free Carbon in air, we get Fire, that is, a strong transforming Force, only because we have paid for it with other analogous transforming powers, namely, the great negative, form-contracting Carbon powers, most extensively utilized or employed in the Organic Chemistry around us. Our Charcoal or wood-fuel Fire-force has, as it were, to be purchased by the destruction of much organic formations, actual and potential. And our furnace flames are fed by an Oxygen that might have fed the higher flame of Life.

CHAPTER XLI.

GUNPOWDER'S ACTION.

WHEN Carbon is touched molecularly with Oxygen, or rather with the great expanding force or the cosmical Heatedness that Oxygen represents, Carbon, though it conducts heat and cold, has no tendency to transmit the oxygenic heatedness towards the Mean earth, as the Metals do, because, for one thing, Carbon is so hard and persolid as to be cold or negative even to the Mean earth herself. Moreover, conductive and very negative or contracted Carbon, being light and very heat capacious, multiradiant and plastic, and in contact with Oxygen, is more fitted to appropriate Oxygen's expanding Force than to transmit it Earthwards. Carbon has its position, reciprocating forces, forms, and character towards Oxygen, so much better than the actual Mean earth, that Carbon is preferred by Oxygen to the Mean earth as a consort or a partner in combination or action. For Carbon has all the characters of a Mean mineral earth, but in greater *Chemical* excellence, and Carbon indeed is the Mean Organic Earth.

In virtue of Carbon's character force and form, great cosmical Expanding Force can be concentrated or focussed on spots of Carbon, and therefore with explosive effects in those Spots; and this happens also, though to a less extent, with Sulphur: in other words, both Carbon and Sulphur are gasifiables or explosive in touch with Oxygen,—as we observe in Gunpowder,—which is composed in ultimates of a thorough mixture of much Oxygen, much Carbon, some Sulphur, and a little Nitrogen with a minimum of Potassium. All of which elements, except the insignificant Potassium, are eminently explosive, or are gasifiable by natural forces: for Carbon, Oxygen, Nitrogen, Sulphur, can all exist in Nature as Stable Gases, singly as the Oxygen and Nitrogen of the atmospheric Air, or in each other's company, as in Carbonic and Sulphurous, Acids. A thorough mixture of Carbon and Sulphur, with much Nitre, is Gunpowder, and is most explosive, because in the mixture exists Nitrate of Potash, with much Oxygen in it, which Oxygen is very gasifiable by the plus Day and Nightshines of the Earth, and which Oxygen is bound or compounded to Nitrogen still more gasifiable than Oxygen. In Nitrate of Potash, therefore, we have much Oxygen that has lost only in small degree, the touch with the plus Day and Nightshines of Earth—an Oxygen that still deflagrates or is explosive; —Carbon free is itself in potential touch with the plus Day and Nightshines; mixed with Sulphur, Carbon obtains much better touch with these Shines; mixed with Sulphur and Nitre as in Gunpowder, Carbon obtains the Best touch with the plus Day and Nightshines.

The Gunpowder mixture of Carbon, Sulphur, and Nitre, excepting the insignificant Potassium, is altogether matter with Force, and Form, and Character that solicit the plus Day and Nightshine powers, the expanding, the exploding Forces of the Earth, and matter also that is most perfectly able to conduct and radiate or admit these Forces, and farther capable of appropriating them; and a Spark explodes this mixture, because a spark suddenly improves the accepting and appropriating capacities of Sulphur and Carbon for these expanding Forces, present always in the all-penetrating and all-permeating Ether and ethero molecular matter of this Earth from her Shapecraft.

In the explosion of Gunpowder no new Force is created; an expanded Form and an expanding Force appear locally, and a contracted Form and a contracting Force in the surrounders, deducted ultimately from the Mean Morphigenic *Heat* Force of the World. The routine ethero molecular Oscillations that are coursing through unfired Gunpowder and things around, can be much increased in width and pitch in Powder Matter if freely admitted to course therein. And a Spark admits them, a Spark increases in Carbon, in Sulphur, Heat Dilatability, Heat Capacity and Radiation; and a Spark therefore opens freer channels in Powder Matter for the play of surrounding Ethereal and Ethero-Molecular, Force and Form, Oscillations; that is, even by a Spark we can explode vast masses of Gunpowder with the routine Oscillations of the Earth, and produce all the Phenomena therein involved.

Carbon in Man's keeping a sooty Drudge, is in the eyes of Cosmical Chemistry one of her most renowned of Chemicals, and swings like a pendulum from the extreme Land force and form of solid Coal, to the extreme Air force and form of gaseous sky Carbonic Acid: and as the Carbon force and form Pendulum reaches, in its swings, up into its uppermost or down to its lowermost extremes of Sky carbonic acid and of Land or Pit Coal,—Carbon becomes most inactive, and then requires some force to urge it again to swing downwards or upwards: and Carbon in Cosmicality is most active in the Middle of its Force and Form swings, or when Carbon is between Air and Land, or when in Vegetation, Carbon is rooted into Land and branched and leaved up into the Air. And in this vegetative position, Organic matter, that is, Carbon and the Organic gasifiables are placed best for the play on them of the sidereal and the planetary shine powers. Clinging or rooted to the dark, solid Land, floating and waving in the shiny, gaseous Air, Organic matter, called Vegetation, can partake duly of the Land force and form, and duly likewise of the Air force and form, or is in touch both with the Planetary and the Sidereal shine powers, and can then produce these Children of the Sun and Earth, the multitudinous forces and forms of Organic Chemistry, particularly during *Working Hours*, or in Dayshine, when the Earth's periphery is at its intensest Oscillation between the Earthshine powers and the Sunshine powers.

It is through Plants, therefore, and during Dayshine, that the Oxygenized Carbon in the Sky, a gaseous Carbon that has parted with Earth-force for an excess of Solar force, can obtain back again some of its Earthshine-force, or can be fixed; and that Carbonized Oxygen in the Sky, a heavy, condensed Oxygen, with too much Earth-force for a Sky Oxygen, can obtain back again its full Sunshine force or be converted to the higher form of pure Oxygen. In other words, Plants and the Dayshine furnish most readily in Oscillations the TWO Forces and Forms required to decompose the Carbonic Acid of the Sky Air, and to fix the Carbon again in the Plant or towards its native Earth, and to free the Oxygen again towards its native Heaven, the higher Skies.

CHAPTER XLII.

FLORA AND FAUNA.

In other words, Flora seems to me one great Channel used by Nature for the transmission of very important Cycles or Oscillations of shine powers, or of electricities, or of force and form power, or of chemicalizing powers, on Earth. A Tree seems shaped on purpose to convey the electricities of Heaven to those of Earth, and those of Earth to the electricities of Heaven. These electricities are one Plus and the other Minus, or one is Solar and Sidereal, and the other Earthly or Planetary. Tapering, pointed conductors perfectly, silently, unobtrusively, absorb and convey away the two electricities. And a Tree is such a conductor. A Tree tapers to points at its upper, and lower, extremities; a Tree tapers down towards its root ends, and tapers up towards its leaf ends. The tree-roots, rootlets, and spongioles, sink tapering into the bosom and depths of the solid, dark Earth. And the tree-trunk, branches, twigs, and leaves rise tapering into the bosom of the sunshiny and starshiny Air. From the underground Earth, therefore, by the pointed spongioles and tapering rootlets and roots, the minus, the darker, the planetary Electricity, the blacker Shines, are taken up towards the Sky and Space, where the Darker shines meet oxygenized Carbon, in the Carbonic acid of the Atmosphere, as a link or a stage of their progress—a Carbon that though oxygenized may still most gladly radiate and appropriate those Darker shines. And from the sunshiny, starshiny Skies, by the pointed leaves and tapering twigs and branches, the plus, the solar, the starry Electricity or the Brighter shines are taken downwards to the underground Earth; in which course the plus shines meet the carbonized Oxygen of the Carbonic acid of the Atmosphere as a link or stage in their progress—an Oxygen that though carbonized, may still radiate and appropriate those Brighter shines. There is, therefore, passing through the tree-roots, trunk, branches, and leaves, and through the tree-leaves, branches, trunk, and roots, a double or an electric current, one minus or planetary or upward or skyward current meeting and oscillating with another plus or sidereal and downward and earthward current, and their Oscillations chemicalizing the tree or plant, or producing the necessaries for its vitality and growth; and also contributing towards the dayshining of the Earth and Sun.

We observe also in the Material that makes that half solid matter or chemical which voluntarily moves, swims, or flies on the Earth-globe—in other words—we observe in the Matter that composes Fauna a great accumulation of Carbon and Nitrogen. In a very characteristic animal substance, in Albumen or White of Egg, we have, besides other matter, 400 equivalents of Carbon, and 50 of Nitrogen; comparatively very much Carbon, and very much Nitrogen. For contracting and expanding powers are essentials in all Quintessential Forms in matter, including also, of course, the Animal Forms and Substances also. This contracting and expanding power needed, in balanced Oscillations, in Form making, is lodged, the contracting, in maximum, in the mean mineral Earth, and next in Carbon, the Organic Earth; and the expanding power is lodged, in maximum, in Nitrogen, and then in Oxygen and Hydrogen. The more the Carbonic contracting power and the Nitrogenous expanding power are used in a Form, the more independent that Form becomes of the mineral Earth, or the more rounded and uncrystallizable the Form becomes. There is comparatively little Carbon and less Nitrogen in the mean mineral Earth. Hence we have on this Planet, two force and form Governments, or Kingdoms, or Chemical Domains, which are analogous to each other, but distinguishable from each other. One of these Science may call the Nitrogeno-Carbonic Kingdom, and the other the Mineral or the Oxygeno-Siliconic Kingdom. Forms built chiefly on the Nitrogeno-Carbonic Earth or foundation, are not so fatally chained to the greater or to the mineral Earth, are not crystals, are not so identified with the actual mean mineral Earth forces. These Forms are rounded or cellular, or are *nucleated* cells or more obtrusively *self*-centred, and these Forms can consequently move to and fro over the face of this Earth-planet—They may swim in her vast Waters, may run or crawl on her mother Lap—They may wing or revel in her airy Skies. Such Forms, thanks to the abundance of Carbon and Nitrogen, are Independents or move at pleasure, or have (as it is said) Voluntary Motions, which the mineral Earth controls, indeed, but cannot entirely forbid.

But Carbon alone could not scatheless abound in the animal frame, nor indeed the Nitrogen; and the Abundance of the One in living forms must always be checked and balanced by the Abundance of the Other: for much Carbon would overstep the mark in one direction, or would fatally enthral any living form with over-solidity and death. Much Nitrogen would dissipate Matter Form in the other direction, or with unbridled expansion. To preserve the highest lives of the Organic Kingdom amid the necessary accumulation in them of much persolidifying Carbon, Nature calls in the efficacious help of an abundance of Nitrogen, the most unsolid and unsolidifiable of all the Earth's matter, the stablest gaseity on Earth—a tithe of whose Giant might we note in Dynamite. And thanks to the remarkable abundance of such matter as Nitrogen in animal structures, the deadly contracting powers of the great abundance of Carbon are there perfectly self-balanced into Cells and Cell-aggregates, and turned into the exceedingly rapid pulses of the higher Vitalities of Earth.

CHAPTER XLIII.

THE FORM-CONTRACTING POWER IN CHEMISTRY.

I VENTURE to revive a doctrine of the Ancients, and to consider Air, Water, Earth, and Fire as still great Elements in Chemistry, at least in Cosmical and Theoretical Chemistry. In gaseous Air, in liquid Water, in solid Earth or Land, exist still the architypes of the three primary forms of matter; and in Fire still exists the type of forces that makes those types of form. Moreover, the Air of the Earth, backed by the external shine powers of the Sun and Stars, is the great centre of the expanding power, or of the Plus heat of the Earth—from airs or gases we get directly or indirectly our Plus Day and Night light and heat, our Plus Lightnings, our Plus Artificial light and heat, and our Plus Life light and heat. And the solids of the Earth, backed by the mass of the whole compact Earth-globe, are the great centres of the contracting power for Earth, or of our Cold and Shade, or of our Death dealing stillness. Nor are the powers and forms in airs or lands, the Plus and the Minus, a moment cosmically separate, but always in molar and molecular Oscillations with each other in cosmicality. And the Waters are the most obtrusive vehicles for the *molar* Oscillations of the powers of Air with those of Land, and of the powers of Land with those of Air; for these oscillations are always perfectly mutually reciprocals: and it must be understood, also, that *molar motions* can be converted into *molecular motions* and *vice-versâ*, as seen in steam engines, etc.

The Waters are constantly, largely, ubiquitously, visibly, Oscillating in form between the land and sky, and the sky and land, as Cloud and Rain, as the higher and lower form pitches of water; and though these form oscillations of water be always accompanied by correlated plus and minus force Oscillations, still these watery force oscillations are (unless during thunder) mostly unobtrusive to us, from constant familiarity—or are called Climate. But it is in no wise only along the Waters of the Earth that the force and form Oscillations between the Air and Land, and the Land and Air, proceed; these Oscillations, howbeit more unobtrusively, also occur along the Carbonic acid of the Earth; along the Oxygen of the Earth; along the Ammonia of the Earth, being in the last in the least degree and in the most unobtrusiveness. By Carbonic acid, Carbon and Oxygen constantly oscillate between the Earth and Air, and the Air and Earth; from breathing and feeding Fauna, Carbon rises into its highest natural force and form, as the Carbonic acid of the Earth's Air, and the Earth's Oxygen there falls into a lower force and form, by becoming the heavier and more liquefiable Carbonic Acid; but in Air, cosmical Carbonic acid does not for an instant remain untouched, but its Carbon falls constantly into the rooted Flora, and its Oxygen again constantly regains the Air form, or rises into Oxygen's highest form. And this Carbon rise and fall or Oscillation in Force and

Form, this Oxygen fall and rise or Oscillation, go on upon the Earth as long as there are breathing, feeding Fauna—rooted Flora—and Sunshine powers and Earthshine powers, upon the Earth. Oxygen falls upon breathing Fauna and rises from unbreathing Flora, in endless Oscillations or in the mighty conflagrations of the vegetable or minus, and the animal or plus Lives of Earth. And even Nitrogen, in the least degree, and with the most unobtrusiveness, oscillates between the Earth and Air, by the transformations of its compound Ammonia.

The great Characteristic of these and of analogous motions, is Oscillation; for they all swing to and fro like the bob of the Pendulum of a clock—at times, in vast *molar* masses, and slowest times; or in other cases, in as minute *molecular* masses, and swiftest times. Their slowest movements are in Eternities, that is, Man cannot count or perceive them for their great slowness; and their quickest movements on Earth are in the pulse of the spectral Ultra-violet, and Man cannot count them or perceive them for their great swiftness. The two Extremes of bulk, time and speed, stultify the Physical perceptions of Man, for all man's faculties also swing pendulum like, in limited to and fro ranges—All except the Faculty Divine.

What are called Chemical Forces, or Heat or Light, are (I submit) certain Oscillatory motions in the all-permeating Ether and Ethero molecular matter, varying in rapidity or slowness. In its rapidity, the sight perceives Heat up to the spectral violet pitch of Force; in its slowness the sight perceives Heat down to Ultra-red, and we call that heat light or colourshine. Man perceives or radiates Cosmical heat or light better than Water does, but not so well as the Oxynitrous Air; Man perceives or radiates Cosmical cold or shade, but not so well as does the black, hard, solid Carbon. The Appreciation and Appropriation of the cosmical heat and light depend, alike in Man and Minerals, on Character. For Perception, character avails more than the external surroundings. All the multisecular cosmical Shine powers of the equatorial Stars and Sun, shine comparatively in vain or unperceived for the granite Rocks. All the multisecular Blacker Shine powers of the Earth herself, shine comparatively in vain or unperceived for her sky Nitrogen Air. How many of us hear what the deafened Beethoven heard amid Penury? How many of us see what the blinded Milton in his Proscription saw?—Starving, sickening, dying—mocked by the long arrears of a niggard Pension—Kepler, self wrapt, could trace the Pathways of Skies.—And Mozart sleeps with honour—in a Pauper's grave.

The chief characteristic of these august Forces is Oscillation. The thus far and no farther guides them either way inexorably; nevertheless even physically puny Man with his spark and Faculty Divine, guides or prompts somewhat those Awful Powers—And is there then in the Unutterable Vastness of the Universe only their Man Guider, is there None that can guide these powers better—No One that guides them best?

We argue that the Sun and Star Shine-powers, that the Plus heat or light or Expansion forces of the Earth do not exist alone on Earth; no not in the Universe; they oscillate with the Earth's or the Planet's Shine-powers, or with the Earth's resisting recoiling contracting force, for ever and for ever.

At her Primary Rocks the planet Earth finally stands at bay against the Sidereal powers; from that Bourne or Bulwark begins the recoil or cold or contracting Wave against the sidereal softening, dilating, melting, boiling Wave of Motion; *there*, the thus far and no farther of the pushing waves has been reached, and a Recoil Wave begins sunwards that only ends in the confines of the Universe, if we had the minds to trace it—for the Whole Universe is One; and when the recoil wave leaves Earth's ethero molecular matter and Ether at the extremest verge of the Sky Air, the wave passes into the pure spacial Ether, the common, the unifying matter of the Universe, and in Ether in space it becomes lost for a time to Man, but not to All things, or All time, or in Eternity.

At the lowest Earth's peripheral rock-depths, at the loftiest of the Earth's aërial heights, there is a Hush in earthly activities; for these are the pauses in the pendulum swing of Nature's motions or Chemistries, and Nitrogen and the Primary Rocks are very inactive on Earth. And the Middle ranks of the chemical and the social Worlds are the *best* workers in the world; among them lie the abundance of oscillators and oscillations.

The Oscillatory movement claimed for Light, I claim also for Heat, for Electricity, for Chemistry or for the Shape and Dye making Force, or for the Shapecraft of the Earth. The Oscillatory motion is, therefore, of the highest importance in Chemistry. And I have tried to show from the molar or visible mutual exchanges of the Forms of two acting chemicals that similar molecular motions of exchange occur between the acting chemicals, and being molecular motions amid Ether, that they develop what is called Heat and Light, or their correlates, during chemical action. And it is, indeed, because molar and molecular oscillation or exchange in Force and Form is possible between the Air and Land, and the Land and Air, that Nature and Man obtain their

Sister Chemistries. If sky Oxygen were incapable of sinking in Force and Form earthwards, if the Earth, or parts of her, were incapable of rising in Force and Form heavenwards, or oxygenwards, we could have neither molar nor molecular motions of oscillations nor the chemical actions between Oxygen and the Land; we could not have even our common and beloved Firesides.

We see that Oxygen can rise on Earth, for Oxygen is a fifth of the sky Air Ocean, and we can see as distinctly that Oxygen can fall on Earth, for more than half of the compact Earth-globe is made of liquefied and solidified Oxygen. And we see by the excess of the solidified over the gaseous Oxygen on Earth that there is a greater tendency in Oxygen to fall than to rise; hence even gaseous sky Oxygen is ozonifiable; hence Oxygen can exist in a very condensed, soluble state, in its *allotropy*, in the peroxide of Hydrogen. And if there is any risen or sky Oxygen on Earth it is because there is no more room for Oxygen below in the compact Earth; for all the Mineral Earth is choke-full or saturated with Oxygen, and sky Oxygen therefore superabounds for the compact Earth. On any chemical that has been artificially and very forcibly deprived of its Oxygen on Earth, as on the positive Metals of Earth, Oxygen is most ready to fall or to solidify in rusting them. Oxygen, therefore, in the sky is most prone to condense, or it condenses or falls into the Mineral Earth most perfectly; and Oxygen also condenses or falls into Carbon, but to a shorter distance, because in Carbon's character there are great aptitudes for rising or reactions. In other words, the falling and oscillatory powers or affinities between Oxygen and the Mean Siliconic Earth, and also the Carbonic Earth, are perfect.

We observe in Hydrogen great powers of rising, for free Hydrogen is the lightest and the most gaseous matter on Earth; but Hydrogen in a Planet having the Earth's character, and having her Solar system, and her abundance of Oxygen, has a tendency to fall into water vapour and into the liquid Waters and into the glacier and polar ice rocks of the Earth. While gaseous, Water has the middle pitch of gaseity, or passes easily alike into liquidity and gaseity; as a liquid water has the middle pitch of liquidity or passes easily alike into solidity and gaseity; as a solid water never far forsakes liquidity. Hence Water is at home in many of the forms of Earth; Water is the best of solvents, being kin to the Earth's lower gases, kin to the Earth's liquids and high solids; Water exists essentially in the Vitalities of Earth, and can exist alike in Acids, in Bases, and in Salts; and it is only in the Extremes of forms of Earth that Water cannot exist.

In Nitrogen, however, we note the least tendency to fall on Earth; for the condensations or the falls of Nitrogen are found chiefly in the Organic Earth, in Fauna and Flora in the high pitched, mobile, living, watery solidities of this Planet. In other words, Nitrogen can oscillate on Earth only in trebles or in the shortest and quickest pulses, near the violet and ultra-violet, the life-housing pulses of this Planet.

I argue, that the AIR, and not the direct Sun or Stars, is our proximate source of Heat—and it is so in Nature, it is so in Art. In a Blacksmith's forge we see that he burns the Wind more than the Coal; for it is by urging the wind blast that he urges the flame heat, and not by putting on more Coal—the Coal may remain the same. It is analogous in Nature. Where there is dense plenty of an Air, which has the full Complement of its usual ingredients, viz., the normal Water, Carbonic acid, Oxygen, and Nitrogen, all of normal density, as at the Equator, at Chimborazo's base,—there we have the Stifling Heat. Climb, however, up fifteen thousand feet on Chimborazo's sides and we still shall have the same, if not greater, Sunshine powers, but no longer the same air; at that height we have scanty Oxynitrous Air, with still scantier proportions of Carbonic acid and Water, and with those scant Airs, and the same Sunshine powers as at the base, we have the deadliest Cold. At these Snow-line heights nothing but the Oxynitrous Air itself and Animals that breathe it incessantly, radiate or oscillate in the direct Sunshine powers. Man, at those heights, because his nervous system in a measure radiates or oscillates with the Oxynitrous Sunshine powers, is oppressed by them, but all else except the rarefied Airs and partially Man or Fauna are contracted in those oscillations of the Snowline, and petrified into silence and death.

There are, therefore, for Chemistry two Centres of force and form Oscillations—the Air, and the Earth centres. From the Air, or the Air's kin, the positive Metalloids, the representatives of the Sun,—part the advance waves of Oscillations—and from the Earth herself, or the Earth's kin, the negative Metals and Carbon and Silicon, etc., the representatives of the Planets or of the Earth,—part the recoil waves of Oscillations; and these Oscillations may be called by many names, for they have many guises, but the principle of Oscillation between Plus and Minus forces and forms can be traced in all of them. And their Perpetuity results as a Corollary of their Oscillatory nature; all Pendulum motions of every grade of slowness or of quickness are stable.

CHAPTER XLIV.

THE GALVANIC BATTERY.

On Earth, therefore, there are two Poles or Centres of oscillatory Motion—the Air or the positive Pole, the primary Rocks or the negative Pole; and between the two flows ever, in the daytime between the Sun and Stars and the Earth, and in the night-time between the Stars and Earth, flows ever, I say, that double, oscillating force current which is called Sunshine and Starshine. Or at the Rock end of the current begins condensing solidifying Force and Form; at the Air end begins the expanding gasifying Force and Form; and between the two there is, in their appropriate habitats, the Oscillations of both or the Sunshine and Starshine, the Chemical Actions, or the Phenomena of the World's being. In the daytime and night-time on Earth there is therefore the giant counterpart of a Galvanic current, or of Chemical actions, or of an Oscillation between the plus and minus Forces and Forms of the Sun and Earth. In a Galvanic Current, one pole of the action partially reverses what the other is doing, or Oscillates with it in Force and Form; at one end, a metal oxidizes, or metalloidizes, or *contracts;* and the other, a metal unoxidizes, or unmetalloidizes, or *expands*. And these actions seen *molarly* distinctly, occur also, necessarily more unobtrusively, *molecularly*, and produce in Ether and ethero molecular matter, the Electric Phenomena, and all their correlates.

In the actions in which the mean Earth mingles more freely, in Oxymetallic or in Metallico-Metalloidal actions, we have a plus and a minus Force and Form that are far-travelled and that are often intense. For the Negative form-contracting force of these local actions has come all the way from the Mean mineral earth, and the Positive form-expanding force of these local actions has also eventually to reach the Mean earth; and the two Forces are strong or intense to come and go so far. It is, therefore, from the Metallico-Metalloidal type of actions that we get Voltaic Electricity; and it is from the Carbonic type of action that we get Fire and Explosions and the Localization of the correlated Morphigenic powers, as is seen in the Carbon of Organic Compounds.

A Galvanic current arises when a Metal metalloidizes, because the Metal acting with the Metalloid earthifies, cools, contracts, petrifies, takes a force and form Equilibrium with the Mean earth; and the Mean earth herself metallico-metalloidizes, or warms, or dilates, or takes a force and form Equilibrium with the acting Metal and Metalloid; and consequently in this action there passes between the obtrusive actors and the unobtrusive actor, the Earth, or between the Earth and the local actors, constant, meeting, and oscillating currents in Ether and ethero molecular matter that develop both a Force current and a Form current, and never the one current without the other. The Form current is double and meeting, and carries contraction or virtual solidity from one pole of the action to one set of the actors, and simultaneously the Form current carries expansion or virtual gaseity from the opposite pole of action to the other set of actors; and accompanying this Form current there is the correlated double Force current, the Plus and the Minus, heat and light meeting and oscillating with cold and shade, the Plus meeting and oscillating with the Minus Electricity, and in most cases quite unobtrusively, but in partially vacuous spaces more visibly striated.

The mean compacter Earth-globe is a mass of Waters on a solid Crust, and both Crust and Waters are made of metalloidized Metals—that is, are made of matter that has much contracted and thereby become Force Negative. Some Metals, however, even without metalloidizing, are very heavy, very solid, or hard to fuse, very contracted, or very Force Negative, such as Platinum; and Platinum, therefore, is already Negative, and even singly represents admirably the solid Earth Crust, made of *negativized* brother Metals. A Platinum Plate, sunk in a Cell of pure water, represents perfectly the mean compacter Earth-globe. The Water of the Cell stands for the Earth-waters, the Platinum for the Earth's solider Crust. In the Water of such a Cell we have an Oxygen that is liquid, and that can become solid on the Earth's Crust. The Oxygen even in water, therefore, is still a Force Positive Metalloid, or one that can give Expansion Force, or that can contract towards the Earth's Crust or its Platinum representative.

In the Hydrogen of the water we have a metal that is liquid and that cannot sink lower in equilibrium with the Mean earth, but is, on the contrary, prone to rise in Form. If we place a Sodium Plate, in this Water-cell with Platinum in it, away from the Platinum in the water, but wire-connected with the Platinum above the water, then we have in the Sodium, a metal connected with Platinum, and far more force and form Reciprocative towards Platinum or the Earth's Crust than Hydrogen. In other words, we have a metal Sodium that can displace the Hydrogen in the Platinum Water-cell, a metal that can take a firmer and more contracted equilibrium with the Oxygen and the Platinum than the Hydrogen of the cell, and consequently Sodium does equilibrize with the Oxygen of the water and the Platinum in the water—that is, the Sodium and the Oxygen contract or discharge Expansion Force or Plus Electricity towards the Platinum or Earth's Crust, and through the Platinum towards the Hydrogen equilibrized to the Earth's Crust and Platinum, and we see the Hydrogen boiling on the surface of the Platinum, and the Oxygen freezing or solidifying or contracting on the Sodium or on the opposite side of the action. In other words, from the contracting Sodium and Oxygen Expansion Force passed along the connecting wire to the Platinum and to the Hydrogen on its surface, and from the expanding Platinum and Hydrogen Contraction Force passed along the same wire, in oscillations, to the contracting Oxygen and Sodium, and on the wire the Force can be seen as Heat and Light and their correlates. The Force that contracts the Oxygen and Sodium is Force, and, indeed, quite equal in might to the more obtrusive Force that dilates the Platinum and Hydrogen, but it is the negative, the cold, the more retiring, modest, feminine Force of the Earth. But neither the Contracting nor the Expanding Force of these actions is got out of nothing nor goes to nothing; the two Forces are dislocated, exchanged, or re-equilibrized in oscillations with each other. The Expansion Force of the contracting

Oxygen and Sodium, when they burn or contract in air or out of the galvanic cell, oscillate as Fire with the Contracting Forces of the Mean earth in the intervening Ether; but from the galvanic cell the similar Forces oscillate in the thick, conducting ethero wire, and are there so spread out as to be unobtrusive. But even on this wire, if it be thinned enough, these two Forces may oscillate as they did in Air, or as Fire, and it is certain that these Forces do spectral force, or heat and cold Work. One Force starts from an oxydizing, burning Metal and boils intensely the liquid Hydrogen of the water of the cell, and the other Force starts from a gasifying Metal, and therefore contracts or freezes the Oxygen and the Sodium of the cell intensely, and the two Forces are given and taken according to the thermal capacities or equivalent proportions of the givers and takers.

The Contracting Force lost by the dilating Platinum and Hydrogen is not wholly lost, being the Force that contracts the solidifying Oxygen and Sodium, nor is the Expanding Force lost by the contracting Sodium and Oxygen, wholly lost, being the Force that expands the gasifying Hydrogen. The action is purely oscillatory, or in a see-saw; one pole or end of the enchained actions falls to make the other end or pole rise, and *vice versâ*, or the risen pole or end remains quite ready to fall and to rise in eternal swings with its opposites, for neither the contraction of the Oxygen and Sodium nor the expansion of the Platinum and Hydrogen in our simplified galvanic cell can be got out of nothing nor go to nothing—they are correlate see-saws of each other—nor is the contraction any underling in these actions, but a worthy antagonist or complement of the expansion, and the polarity of these two Forces in the Battery and throughout Creation is most perfect. And these currents, dogged to their ultimates, are Guises or Disguises or Sparks of the Dayshine or of the Nightshine.

In the water of the cell we have each Atomy of water composed of an Oxygen and a Hydrogen Atomy, joined together polarly; Hydrogen being the Atomy, that is most contracted, is best equilibrized to the Earth's crust, or is the most Negative pole of a Water Atomy, and will turn and be attracted or pushed to the Platinum the moment it becomes positive by receiving along the wire the expanding positive force of the oxidizing Sodium; and Oxygen being the positive pole of the Water Atomy will turn and be attracted or pushed to the contracting Sodium or Zinc plate of the cell. Even in the *water* of the cell in action, therefore, there is a double or a positive and negative current, analogous or correlated to that on the wire, but in the cell water the positive current flows with the Oxygen part of a Water Atomy Sodiumwards, and the negative current flows with the Hydroden part of a Water Atomy Platinumward. Consequently in the cell water the direction of the currents is reversed compared with the wire currents. For a correlated, but not the same current flows, in the Cell Water and in the Wire; Water and Wire are incapable of conducting the same pitches of the electric force.

A Sodium plate sunk in our galvanic cell of pure water, apart in the water from the Platinum, but thereto connected by wire above the water, is in direct touch with the Platinum and more indirectly with Hydrogen, and directly with the Oxygen of the Water. And between the Sodium on the one hand, and the Oxygen and the Hydrogen and the Platinum on the other, there exists a rtain force and form Reciprocity that brings on action r spark striking between them all; for Sodium is light, sible, volatile, and is thus somewhat like the Oxygen ith which Sodium has to combine, and the Hydrogen hich Sodium has to displace. If, however, Sodium were eavier, less fusible, less volatile, as Zinc is, then Sodium ould lose part of its likeness to the Oxygen's and ydrogen's Forces and Forms or the force and form eciprocity would be diminished between such Zinclike odium and the Oxygen and the Hydrogen of the cell, he spark striking distance would be so widened as prevent action; in other words, if you place Zinc nstead of Sodium in the galvanic cell of pure Water nd Platinum you have no action or spark striking. nd to restore action you must obtain a force and form eciprocity between the Zinc and the Oxygen, which you o by acidifying the Water or making its Oxygen denser r liker the Zinc form and force.

For the range and scale of Cosmical Heat or of lectricity there exists several Clefs of heat pitches. here exists that Clef in which the stabler airs oscillate; hat Clef in which liquids oscillate; that Clef in which olids and persolids oscillate. The Electricity or Cosmical eat and Cold developed by disequilibrizing the airs and olids, as in lightning and friction Electricity differs n Clef of pitch from the Electricity developed by dis-quilibrizing liquids and solids, as in Voltaic Electricity. nd the Air connected Electricity will pass readily through ir, or has, as is said, great disruptive discharging power r tension, because being induced or developed in Air and olids it has the Clefpitch that oscillates or passes readily etween Air and Solids or the Earth; but Voltaic Elec-ricity being induced or developed in liquids and solids, or in other Clefpitches, cannot so readily pass through airs, or has less tension. But the difference between tension and non-tension being one of higher and lower Clefpitch, the tension difference disappears, when the pitch difference is equalled.

CHAPTER XLV.

CHEMICAL STRICTURES ON THE CURRENT THEORY OF COMBUSTION, ETC.

IT misgives me that the foregoing Ideas do not square with the orthodox explanation of the development and the source of the Heat and Light of burnings or of the phenomena of Combustions and of Galvanic Electricities. —"*E pur se muove.*"

And better to contrast our heterodox with the orthodox Theory of Combustion, etc., we recapitulate the chief points in our Interpretation of combustion, preferring for description that Burning which is the most perfect or hottest.

The hottest Combustion on earth is that between Gaseous Oxygen and double its volume of Gaseous Hydrogen.

The phenomena of this Oxyhydrogenous Combustion may be viewed in the old manner; and then the very great Heat we obtain by this burning is the Latent Heat of the highest Gaseities of Earth discharged by the watery liquefaction of those gaseities the two burning Gases. That the Gaseity concerned in the burning is of enormous high pressure we ascertain by the great cold and pressure needed artificially to condense small portions this Gaseity; that in Burning this Gaseity liquefies self-evident. We can therefore conclude that the gre Plus Heat discharged in this burning is the Laten Heat of Gaseity made sensible by the very sudden downward Statechange of liquefaction in the gaseous matter of the Gases. Moreover, this liquefaction or cooling and contraction of the burning Gases arises because Hydrogen conducts and ozonifiable Oxygen radiates the dark minus heat or cold and contraction from the mean Earth, and both Hydrogen and Oxygen have the force, form, and character reciprocity towards the mean Earth, all of which the mean Earth conversely reciprocates. In this burning two very high pressure steams, Oxygen and Hydrogen, are cooled and pressed, not with the slow, awkward pressures and colds of art, but peremptorily, instantaneously, by the greatest Cold and Pressure Forces on Earth, those of the Mean earth. To this natural Cosmical Cold and Pressure, the two Gases yield, *per saltum*, for we know that they do yield to our own slow and awkward colds and pressures; and yielding suddenly and greatly, what more natural than that the Latent Heat they yield up by their liquefaction or burning should be great—aye, the greatest on Earth, since it is the Latent Heat of by far the greatest of Gaseities.

Viewed, however, by the dynamical conception of the Photothermal Force, the Ether and the ethero Atomies of the burning Hydrogen and Oxygen, backed by the sidereal Sun and Star Force, plus oscillate along the terrestrial Ether, in force and form, in expanding motion, against the oscillating, recoiling, contracting motions from the Forces and Forms of the Mean morphigenic thermal force of the Earth, into a watery equilibrium of Form and Force

Pulsations; and by the presence of the Waters of the Earth, the Planet Earth is softened and liquefied, and can give powerful recoil or contracting oscillations to the corresponding expanding oscillations received from the oxygen and the hydrogen or the Sun and Stars; and this planet thereby develops its own special aëro watery Shine and Form, and helps also the development of the parallel or correlated Shine and Form in the Sun and Stars.

The Force and Form of the burning Hydrogen and Oxygen are very expanded and gaseous, the Force and Form of the burnt mean Earth are very contracted and solid; there is, therefore, *a very wide gap* between the Forces and Forms of the burners, the Gases, and of the burnt, the Earth; so that the oscillations of Force and Form along the Ether between the burners and the burnt are of *the widest amplitudes*, or are such as can give the intensest Heat. But as the burners, the Oxygen and Hydrogen, are the rarest matter on Earth, their burning gives less light until a denser but also perfectly oscillating medium, such as Carbon dust, is added to the burners; or until the Gases be themselves condensed mechanically before and during the burning.*

The accepted or orthodox theory † of the source of Heat of this Combustion is, however, that the chemical action itself produces the Heat by the conversion of the motions of chemical Atoms into Heat Pulses; and this is, so far, most true. But the theory (particularized) goes on to say:—

"That we have Atoms (*in chemical combinations and*

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* Frankland.

† Dr. Youmans' "Class Book of Chemistry" (page 236). New York, 1863.

combustions), separated and powerfully attracted, like lifted weights, they rush together, collision arrests motion, and their force is given out as heat. It is the clash or impact of the atoms of *oxygen* against those of *hydrogen* which gives us the heat and light of their combustion. By figuring to ourselves the atoms shot across the molecular spaces with intense force and thus parting with their excess of motion, we have the explanation of the heat of combustion," etc., etc.*

This Theory says that in their Combustion we have the Atoms of Oxygen and Hydrogen separated; but Fact says that for all Chemical actions, Combustions inclusive, Atoms are in the VERY LEAST degree separated, or are very near each other; and the nearer the better.† This Theory says that these Atoms of *Hydrogen and Oxygen* are like lifted Weights; but Fact says that these Atoms are as unlike Weights as it is possible to be, the Atoms being the smallest conceivable particles of the lightest of all known bodies. This Theory says that these Atoms of Hydrogen and Oxygen clash together, and produce by their clashing the most enormous Combustion Heat known to us. Hence this Theory says that the nearest, the smallest, the lightest of particles, are the very best clashers on Earth; but Fact, or Reason, says quite the contrary. We have, therefore, a Theory that says one thing, while Fact is saying peremptorily the opposite; and in such a case, if we be truthseekers, and not mere theorymongers, we will cleave to Facts and forsake the Theory.

But even if the clashing Theory fully explained the

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* Dr. Youmans' "Class Book of Chemistry" (page 236). New York 1863.

† Tyndall on "Heat," p. 192.

Heat of the burning, still it fails to interpret, and, indeed, ignores, the equally present Cold of the burning, or the *burning's analogies with electrics;* and the Theory passes over also the constant and important transformations of the burning actors. And consequently, although the clashing Theory may content Physics, it cannot satisfy Chemistry. And in this case Chemistry has a better right to a complete satisfaction, since the phenomena of Combustion belong more to pure Chemistry than to pure Physics, and are always rigidly knit into correlations. And if in burnings Plus Heat appears, it is ever oscillating with Minus Heat, both attended by form oscillations, or reciprocal transformations in matter; and all the phenomena bearing the closest kinship to electricity and its correlates.

And although in life I may not catch even the Ear of Science, still I have an appeal to Truth and Time, saying steadfast to both *Feri si ex re sit.* And I have hopes that in the lapse of years, when the tide of opinion turns, it may become safe and gainful enough to tempt some Penny-a-liner, on the scent of profit, to unearth my obscurity, and to patronize me in fine English—when the Matter or the Body that housed these *loved* Thoughts shall be dust, and I myself, the Thinker, shall have long been in Nirvana with the ORIGIN of Thought.

CHAPTER XLVI.

THE DAYSHINE AS FIRE.

COMBUSTION, of all Chemical actions, most nearly touches or concerns Humanity. For in Man himself is burning the Flame of Life, and that Flame is kindled by another Flame—by the Positive Shine Powers of the Sun and Stars. Humanity's crown of questions, therefore, is—What are the Sun's Shine Powers? and what their end? —And the answer seems to me to come back from the glories and the immensities of the Universe, proclaiming to us that though there be local dark spots of death in the Sundisc's shine power, and local dark spots of death in the Life Flame of the Earth, still that the Cosmical sunshine power, and the Cosmical Life's shine power, burn in cycles, or potentially for ever.

Standing at noontide amid an Equatorial landscape, Man is dazzled by the cloudless Daylight, and roasted by the fierce Dayheat. And Man may be easily convinced that the positive oscillations of the Sunbeams may kindle more than white hot fires. By Night and by the Starry sky and telescope Science gathers that there is a Universe, and that its Stars, in the firmament of Heaven, are greater, lesser, equal, Suns. And that the uncountable

Stars likewise furnish to the Earth sun-like, positive oscillations, for more than white hot fires. Science knows, further, that the Celestial Sphere that surrounds the Sun and Earth, and holds the Visible Universe, is apparently five million times larger than the apparent Solar Disc. And Science's telescope knows that from all this Sphere more than a Hundred Million Stars flood each other, flood the Sun and the Earth and his other Planets and all Planets, with positive photo-thermal oscillations or plus shine powers—so much so that for the cosmical Earth this Starshine's effects were found by Pouillet to be nearly equal to the Sunshine's effects; for the Stars are Suns, and make up by their vast numbers and ubiquitous distribution and unsetting shine powers, for their distance and lesser intensity of shining. And if the collective Starshine Power can so plus heat the Earth-globe, it may also plus heat the Sun-globe; all the more that the Sun-globe is very large, very light-weighted and presumably very Heat capacious and plastic, and radiant to the Positive Shine Powers of all his brother Sunstars. The Sun in that case will not be cooled, or minus heated, by all the radiation of the Universe's space, far from it, the Sun is thereby, on the contrary, much plus heated. For throughout the Universe's space the Sun's radiation greatly meets the counter radiations of millions of his lessers, his betters, and his peers—to which counter-radiation the Sun's reciprocating Starry or Metalloidal or Positive Character, attunes or hypersensibilises him. And it is only when the Sun's Radiation meets in the Universe's space with the counter-radiations of the darker, cooler, the negative Planets, specially of his own system—but also of all the other systems of the Universe—that the Sun gets veritably cooled or Planet contracted. As long as the Universe itself is on plus Fire with its millions of Suns, and the Suns themselves have the Positive Metalloidal Character, there will be (I submit) enough of Fire Power or of the positive ethero material oscillations to kindle our own Sun, and, indeed, the Suns of the Universe. But the enormous stellar positive Light and Heat of the Universe that kindle our Sun, or in the midst of which our Sun basks or expands, cannot over-heat or dissipate, that is, over-expand our Sun's matter, like to Perihelion Cometary matter, for the cooling effect on our Sun of the enormous planetary negative Light and Heat, or the Shade and Cold of the planetary Universe, in the midst of which our Sun shivers and contracts. And if we imagine the Sun's heating and expansion by the stellar Universe, and his cooling and contraction by the planetary Universe, to balance and to oscillate rapidly—then our Sun and all his brother Suns may burn or shine as long as there is a Universe of uncountable Stars and Planets in Ether, a Universe of sidereally and planetarily charactered ethero matter, and in it, the expanding and contracting molar and molecular oscillatory motions of the Spectral Force. In other words, our Sun, our Earth, accompanied by the Family of Heaven, by all the Suns and Planets of the Universe, will burn or shine in Ether as long as the Omnipotent Tender Mercies of God give the characters and the oscillatory photothermal motions to the ethero matter throughout the Universe. The Sun and Earth and Universe will burn as long as the Tender Mercies of God—or for ever.

But it is not in Heaven alone, it is not between Suns and Planets alone, that fire blazes. On Earth fire likewise blazes and always also between Sun-like and Earth-like matter, Positive, Sidereal-like matter, Negative, Planet-like matter. And although the Earth-fire be a very tiny passing spark indeed, nevertheless this Earth-spark is as much fire as the vast conflagrations of the Universe. All fires, everywhere, are so far kin as to be mutually comparable. For the whole Universe is One; One in Matter, One in Force, One in Plan, One in Creation, and One in the Hollow of a Mighty Hand.

On Earth we have Matter that kindles easily when touched with Oxygen, which is an analogue of Sunshine Powers. Phosphorus or Carbon, touched with Oxygen, and started in their own oscillations by the similar oscillations of fire, catch fire or oscillations and kindle, and are then analogous, Carbon to a Planet-globe, and Oxygen to a Star-globe, started in their oscillations by the similar oscillations of the Universe, or kindled into burning by a Universe on fire. Carbon is Negative, Oxygen is Positive; approached to each other, or brought face to face and touched with fire, both kindle, both burn, both transform. The Earth-globe is Negative or Planetary, the Sun-globe is Stellar and Positive; approached to each other, brought face to face as Universe's Matter, and touched with the Universe's Fire, both Sun and Earth kindle, both burn, both transform. But the Light and Heat and transformations of the Earth and Sun, that is, Nature's grand burnings, awake the Life, the Forms, the Loveliness of the Universe, or are to much better purposes than Man's burnings, which, however, in their humble way likewise awake many phenomena that are not quite unanalogous to the Natural phenomena of burning. Howbeit even the stupendous burnings between our home the Earth and the Sun, so awfully magnificent and important to Man, fade into the glimmer of the tiniest of sparks amid the eternal fires of GOD'S UNIVERSE.

We repeat. The Earth has the negative, planetary chemical character, the Sun has the positive stellar chemical character, and for the Universe the Earth and Sun are as near each other, and as tiny as our bit of Charcoal and Oxygen are for the Earth herself. These two tiny bits of Universe matter, our Sun and our Earth, are for the Universe in chemical contact, and catch fire when held up together in the vast Universe, to the Star-torches of the Sky, catch fire and burn as Carbon and Oxygen, as our earthly lamps catch fire and burn with our match or our torch.

On Earth we feed our fires chiefly with Wood or Coal and Air or Oxygen. We burn that matter-fuel, Oxygen, Wood, or Coal, that not only can burn well, but that also can again be unburnt, or restored to the original burnable condition. Matter-fuel, Oxygen and Carbon that are constantly unceasingly not only being burnt on Earth, but also *pari passu,* unburnt—there is not the millionth millionth of a moment on Earth in which there is not some Oxygen and Carbon burnt *and unburnt.* The burning and the unburning go on side by side, are cosmically, quite continuous, and in oscillations or cycles, and consequently potentially everlasting. Our chief fire on Earth, the Oxycarbonaceous Fire, is derived from matter, the Oxygen and the Carbon that have been again and again continuously burnt and unburnt as far back in the ages of Time as our Minds and Geology can find record. Matter that in the shape of Wood or Flora or Food is burnt in Oxygen by breathing Fauna, burnt in Eremacausis, burnt in Man's Fire-raisings, into the Carbonic acid of the Earth's Sky. But Matter that is again continuously unburnt and recovered from the Earth's Sky and converted by the Dayshine and Flora into Free Burnable Oxygen, and into Burnable Carbon, or Wood; which itself is ultimately in the depths of the Earth's crust, wholly earthified or solidified, or petrified into Coal. So that on Earth we have matter, Oxygen and Carbon, that not only catches fire easily, but that after it has caught the fire oscillations, or has burnt, or has given us Fire, is again *pari passu* unburnt or that can be continuously made again and again as ready as ever to repeat the same Fire catching, the same Fire-giving, process; we have fuel or combustibles, and fire or combustion, in oscillatory, in cyclical or ringed perpetuity, or we have the wherewithal of everlasting burnings. Always provided there continues to exist together on Earth, and for Earth, positive Oxygen and Fauna, negative Carbon and Flora, positive Sunshine powers, and Negative earthshine powers or the Dayshine. Under these persisting Conditions we have actually on Earth, as a matter of course, or staring us constantly in the face, an earthly Combustion, called Life, etc., that if not everlasting is ringed or oscillatory or cyclical, and is potentially Cosmically so.

Man, the Highest Life or Flame on Earth, never loses direct intimate touch of Solar matter, for he constantly breathes Air or Oxygen and Nitrogen; neither does Man ever lose touch of Earth-matter, he is of earth earthy, he is made of Carbon, he feeds on Carbon and Water; the living man, however, needs most the intimate Solar touch; he breathes, while he lives, incessantly, but he drinks and feeds, at intervals. Living Man himself is therefore thoroughly identified with the vast cycles of oscillations that stir even the confines of the Universe, for his physical life oscillates with the *sun and earth* Forces, and the Universe. The potentials for the Life flame and the Fire flame lie in the negative or planetarily charactered matter called Carbon, Flora, etc., and in the positive or sidereally charactered matter called the Organic Gases, Fauna, etc., and in the negative or planetary shine powers or motions, and in the positive sidereal shine powers or motions. Such-like Matters, such-like Characters, such-like Shine Powers, develop (I submit) all the fires or the oscillatory ethereal and ethero molecular motions, not only in the sparks of Earth, but even in the everlasting conflagrations of the Universe.

Having here on Earth oscillating matters, oscillating characters, oscillating shine powers that assuredly give us the Vestal flame of Life, or the oxycarbonaceous burnings. And having presumably, at least, analogous and better oscillating matters, characters, shine powers in the Universe, we hope for a Vestal flame in the Sun, Planets, and Universe—a hope, a trust of Immortality or of the everlasting conservation of Matter, of Force, and of Form or Order, that is, of the matter-overtopping Thought—the FATHERTHOUGHT and the *Childthought.*

In the Day and Night shines nestles Life: of the Day and Night shines is born Chemistry; from the Day and Night shines irradiates the unspeakable Loveliness of Nature—and the Immensities and Glories of a Universe, and *a Still Small Voice* assures us that they shall never perish, proclaims that Matter, Force, and Form or Order, which last is Plan or THOUGHT, shall perish only when the all-wise, the all-mighty, and the all-loving ABBA ends.

The Dayshine and Nightshine are, therefore, a compromise between the Sun and Earth, between the Starsuns and Planet-earths, and belong to both. There is, therefore, Earth Cold in Dayshine as well as Sun Heat, there is both Heat and Cold, the plus sidereal with the minus planetary force, the centrifugal with the centripetal motions. And if we liked Cold as well as Warmth, or if Cold drudged or even blustered to us like Heat, it is probable that Cold would easily usurp the honours of Heat in our estimation of the Forces of Nature. But as Cold is less self-asserting or less self-advertising than Heat, Man mostly gives cold the go-by, or thinks most of Heat. Howbeit, though not such a favourite, Cold does exist in Nature as well as Heat, and assuredly in no very underling capacities, for Cold directly changes the Forms, and Forces, and Aspects of half an Earth-globe in Winter. And, moreover, the still more unobtrusive Cosmical Cold of the Earth's Shapecraft, indirectly or through Matter's Character, gives more or less of the Contracting Form Power to all the Peripheral Earth-matter up to Ourselves. But Cold is never the Active, but the Reactive Power, and the Cosmical Cold, best seen by scanning the homologous strain of Carbon throughout the Organic Compounds, serves but to receive and fashion the Plus Force represented by the strain of the Organic Gases, serves to be, as it were, impregnated by the Heat or the Plus Force, therewith shaping a something, or evolving a compound, as the feminine or the warmed ovular principle, impregnated, evolves and develops the embryo, amid the Matter and the Forces of this Earth. Cold is, indeed, if taken in the abstract, a Power mighty though comparatively or relatively passive; it is, as the Feminine Principle in Nature, unfitted for the Originating activities, but intensely Receptive and Adaptive of impregnated or communicated Energies. Consequently we can in no wise dub Cold as inferior to Heat, but rather as its most harmonious complement. There is no Harmony unless the Basses sing with the Trebles; there is no Law, or Order, or Harmony in the phenomena of Chemistry unless Heat be balanced to Cold, and, indeed, Cold to Heat. And Bass is as much Music as Treble; Cold is nothing but Heat a little weakened; and the Feminine is to the Masculine as Planet-power is to Sun-power.

CHAPTER XLVII.

DAYSHINE AS FIRE.

The Earth shines with the Sun, but the Sun also shines with the Earth. The two shine together. We have no experience of their shining apart. No one, and least of all Science, can speak of the Sun as shining alone upon the Earth; such a thing is unknown. In Moonshine, also, the Sun, the Earth, the Moon are all concerned; they never shine apart. Though most natural, it is most inaccurate to speak of Sunshine, Moonshine, Earthshine as singles; in rigid Science such things are totally unknown. We see, however, that the Earth shines with the Moon and the Sun in a very different way from that in which the Earth shines with the Sun and Star-suns.

When the Earth shines with the Sun and the Star-suns, many tons of a solid mass of her outermost matter, called Nitrogen, Oxygen, Carbonic Acid, and Water, are volatilized and boiled, and thereby converted into the Earth-globe's case, the forty miles thick Air Ocean, and likewise many tons of a common mat [illegible] d the Oxide of Hydrogen, which overspreads th [illegible] often miles deep, is moltened [illegible] of the Earth, and at the s [illegible] more solid matters is vivified into Fauna and Flora, and expanded and softened into the Soil and more superficial Lands of Earth. Consequently, when the Earth shines with the Sun and Star-suns, the mere shining is but an Item of the action, for besides the shining there are many accompanying commotions in matter, or much and wide-scattered matter transformations in all the Peripheral Earth-matter, and most especially in Air, Water, and their kindred matter of Fauna and Flora, and their more immediate belongings, the softer Lands.

When we look, therefore, up into the Day's Sun-disc in the sky there is, in a straight line between us and the disc in the sky, an Air Column of the diameter and shape of the Sun's disc, but many miles long, and consisting chiefly of oxynitrous Air, and also of Carbonic acid and Water, gasified, volatilized, positively by Sun's shine power; that is, an Ethereal ethero molecular Air matter Column which is seething or pulsating, or oscillating in most violent, *molecular* commotions with all the pitches or refrangibilities of the Aërial Spectral Force of this Earth. When we gaze up into the Sun's disc, therefore, we perceive not so much *the actual Sun disc itself*, but what it has produced on Earth-matter; namely, an Air Column of miles long Ethereal, ethero molecular matter, seething between the Earth and Sun shine powers, a Column whose upper end is in the apparent Sun-disc, whose lower base is in ourselves and the Earth. In this forty miles long Air Column there is the widest matter transformations on Earth, for there solids are gasified into steams of very startling high-pressure or expanding powers: there is the most ample and rapid Ethereal ethero molecular Oscillations on Earth, the most dazzling light and the fiercest heat on Earth; and from the Column's sides are propagated into the surrounding

Air masses legions of pulsation, or oscillations which are perceived by us as quivering, glittering Light Spokes all around the Disc Column. With the middle and lower pitches of the oscillations or refrangibilities of the Ethereal molecular ethero matter of this Air Column, Man is identified, because Man is made of modifications of the Air Stuffs, specially of the lower and middle Airs. Man is made of medium forms of Carbon, Hydrogen, Oxygen, and Nitrogen, all of which are in higher Forms found in Air. Moreover, Man lives in the lower and middle Air Ocean, as fish live in the Water Ocean; and in his Air Ocean Man breathes in and out incessantly. Man, therefore, is most thoroughly identified with the lower and middle Air Ocean: he belongs to it and the Air to him: he is made of it, lives in it, and breathes life from it; that is, Man himself molecularly oscillates in ethero molecular pulsations similar to those in lower and middle Air. Physical Man, therefore, exults joyously in the Dayshine in lower and middle Airs, for it is the Shine in himself; he delights in the gorgeous colours of the Rainbow, for he himself is in ethero molecular tune with them, and the Eye-brain thrills with them. Man perceives fainter and fainter, and with the special sense of sight, the Airshine Pulses in Octaved Trebles up to the Violet, and in Bass down to the Red, and calls them Light and Colours; and with his other rougher senses Man perceives the Spectral pulses in Basses, below even the Red, and calls them Heat or Warmth. When the Pulses are Cosmical and get to be those of High or Upper Air, or to be above Violet, they become, as it were, Supra-Trebles; and they then are too gaseous or too quick to be identified with Man or to be perceived by Man. When the Pulses are Cosmical and get to be those of the Solid Rocks, or *Infra* Ultra-Red, they become, as it were, Infra Bass, and they then become too solid or too slowed to be identified with Man or to be perceived by him. Of the beauteous Spectrum, therefore, Man only perceives what corresponds to the Spectrum in himself, viz.: the Lower and Middle pitches of Force, the Rainbow colours, and the medium Heat. In other words, Man ignores the Upper and Lower extreme pitches of Spectral Force, as he ignores them in the Music Force, if these Spectral Pitches be in Cosmicality; and if they be local and intense they destroy Man, and are called by him Extreme heat and Extreme cold.

Consequently the Heat, the Light of Dayshine or Nightshine are partly in Man himself; they do not belong to the Sun and Stars alone, nor to the Earth and Planets alone, nor to Ether and Ethero Molecular Matter alone. That light, that heat belongs to the One Universe, belongs to all God's family in Heaven and Earth: to the Suns, to the Earths, to the Ethers, to the two kinds of Ethero Molecular Matter throughout immensity, and reaching down to the humblest, even to the Airs, the Waters of the Earth, and to their Living Progeny, and to Ourselves, and *may* make us, therefore, as Ministering Flames of fire in the Holy of Holies, in the Starry home of God.

When we face the Sun, therefore, we look into that part of Earth that is the most Heavenly, or that is in the most direct communication with the Sunshine Power, and that is most widely transforming, or that shines most. We then see a round space of flame, surrounded with legions of quivering, glittering light spokes; and it is *this* that we call the SUN—forgetting every other thing besides—and, strangest of all, forgetting even ourselves—forgetting the tons upon tons of that outermost Earth-matter called Nitrogen, Oxygen, Carbonic

Acid, and Water that are boiling, seething, rushing up constantly to steams of incredible high pressures in the Earth's Air Ocean, and in direct lines between the Sun and Earth. In such lines the Day's flame-heat is almost unbearable to us, and the Day's flame-light bedazzling. In such lines there is *an Actual Cosmical flame,* or Air-gas incandescent, or oscillating in the highest compass of the gaseous Spectral Force for Earth; nor is there any other higher heat than in such lines possible on Earth; for after all the heat on Earth is that derived from the oscillation of Earth-matter, and in the Air Ocean we have our best oscillation in matter, or our highest Heat-Light-and-Life-Givers.

Man was born and Salamanderlike lives in this Day and Night flame, and cannot indeed live long out of it; howbeit, we seem seldom to think of it as flame—our notion of flame being a something that burns us. But although the Dayshine be full of flame, it does not burn us except with the heat of life, because the Dayshine is Cosmical, or nowhere concentrated, and we and all things share in it, by taking it by character and thus are equilibrized to it; that is, we were free to take and have taken by choice, all that we are capable of taking from these flames. A local flame being disequilibrized to most things around it, by being concentrated to spots of things and time, burns us by equilibrizing Man to its near Concentrated Heat, for which Man's frame is unprepared and unfitted.

When the Earth shines with the Sun, therefore, we may have golden-yellow, and red-lighted Clouds, and blue-violet-lighted Skies, and Heat, all produced, because we have the waters, the Carbonic acid, the Nitrogen, and the Oxygen, filling the skies, all identified in the shining; and Man himself is stirred by his most jubilant sensations, for Man likewise is identified with the shining of the Earth and Sun, and indeed, not only the Living, but all Nature seems to awake and rejoice with the Sunrise on Earth.

When we place ourselves in direct lines with the Sun, we feel warm—that is, we expand, and part of our solidity melts and boils into a steamy perspiration. And when we place ourselves out of the direct Sun lines, we feel cold and contract, and may contract even to hard solidity and death. And what happens to ourselves happens likewise to the very Earth-globe itself.

Where the Earth-globe is most constantly in direct perpendicular lines with the Sun, as in the Equatorial regions, the Earth globe feels warm and dilates, which is to be perceived in those regions by more vegetation, by more fauna, by more sky moisture, by more clouds, by warmer airs and warmer oceans. Where most under the Sunshine power in the belts next the Line, the Earth-globe has its air more heated, that is, expanded, has its sky waters more heated or expanded, as sky moisture and clouds, has its land-waters more heated or expanded, has its Carbonaceous matter, in a more abounding fauna and flora, heated and expanded. So that we have the Earth's Equatorial zone or belt greatly expanded, but by the simple Sunshine power. Consequently part at least of the excess of the Earth's Equatorial diameter over the Polar, can be ascribed to Sun and Starshine power, and not to the effects of centrifugal force in a hypothetically whilom molten Earth-globe. For if the Sunshine power be capable of dilating the Earth-globe quite obtrusively so far, it seems capable of being the more unobtrusive dilator of the Globe still farther; for after all the Globe is one; and there is nowhere a barrier in the periphery to the Sun's effects. It seems to me, therefore, more scientific to ascribe the Earth-globe's oblateness, or the dilatation in the Earth's Equatorial diameter, to a Fact which is the very great Sunshine power rather than to any Hypothesis.

CHAPTER XLVIII.

THE MOONSHINE.

The Moon is not only a Planet, but a secondary Planet; that is, the Planet of another Planet, or of the Earth. The Moon has, therefore, doubly the Planetary shine tuning or chemical character; that is, the Moon's matter is hard and infusibly solid, or highly negative. The Earth's Dayshine lasts about 12 hours; the Moon's Dayshine lasts much longer, or about 360 hours. Greatly by her shorter Dayshine the Earth is softened, melted, boiled, or is furnished with her soils, her waters, and her airs. During her much longer Dayshine, the Moon keeps perfectly a hard and infusible solidity.

The Moon's Dayshine is produced because she is placed in or between the Sidereal and the Earth's Shine Powers, for the Moon may be held a portion of the Earth-matter, like a cloud placed in the analogous Dayshine flame, like a lime-ball light placed in the analogous Oxyhydrogen flame. And by her very solid Planetary character, the Moon cannot absorb heat equal to that of the Earth, or cannot gasify in this heat, but can become white-hot in it, as a cloud in Dayshine does in Oxynitrous heat, as a lime-ball does in Oxyhydrogenous heat, and neither more nor less than white-hot. But although white-hot, the

Moon is far off, and although we can perceive her light well, we cannot perceive her heat for the distance; light being perceived much farther off than heat.

From the very planetary, very negative, very hard, solid Moon, the Earth obtains no positive Shine Powers; the Earth indeed gives them Moonwards, as much as the Earth's own planetary character allows, and because the Earth is helped by the Sun. Consequently, during what is usually called Moonshine, there is no very active matter transformations going on in Earth-matter between the Moon and Earth. And the Moon even at full or with all her splendour, rises in the East most placidly. Her round rim is sharp cut, or unquivering or rayless. Her light is serenely white and wan, and we face its utmost without an eye-pang. A sadness rather than a jubilee from Nature greets the Full Moon's rising or her coming face, amid the pale, silvered clouds of the East. And a sleepy stillness steeps the Moon's nightly reign over us and the world.

Howbeit there is a give and take, or an oscillatory exchange of plus and minus Shine Powers, between even the Earth and Moon, backed, however, always by the Sun. Those portions of the Earth that are the easiest to move, and that are the most Sun-heated or Sun-dilated, namely, the Waters and the Airs of Earth, oscillate molarly as tides with the Moon and Sun; the molar being a sure indication of the molecular oscillations with each other. Whenever the Earth-globe is in a position to be most cooled by the Moon while most heated by the Sun, at New and Full Moons, the tidal oscillations are the greatest, and that necessarily throughout the whole line of heating and cooling in the Earth-globe, or throughout the whole diameter of the Earth-globe. So that we have the like tides at opposite sides of the Globe.

CHAPTER XLIX.

THE INACTION AND ACTIONS OF NITROGEN IN THE AIR OCEAN—THE NASCENT STATE.

From uncounted Stars and from the Sun, constantly beat down upon the Earth-globe, the plus photothermal oscillations, or the kindling Shine Power for the Dayshine and Nightshine of the Earth. And it is Nitrogen that, casing the Earth-globe with an atmosphere, appropriates the highest heat and light of Dayshine and Nightshine, cooling and darkening them into the lowered pitches in which they can become general property in Earth-matter. And if atmospheric Nitrogen were not, it would be impossible to keep the Waters, the Fauna, the Flora, and the rest of the peripheral Earth, warmed and lighted by Dayshine and Nightshine up to the pitch needed for the vitalities of the Earth. Bad indeed would it be for the organic offspring of Mother Earth, were the atmospheric Nitrogen (as now held) only diluting its neighbour atmospheric Oxygen, and not the rather diluting and diffusing the Dayshine and Nightshine to suit the radiations of all the matter of the peripheral world. As a diluter and diffuser of the Dayshine and Nightshine, Sky Nitrogen is superior to its brother, the Sky Oxygen: for Nitrogen abounds in the Air Ocean more than Oxygen, and Nitrogen is also more unchanging there than Oxygen. And so great are the values of certain pitches of the Dayshine and Nightshine for the Waters and the Lives of Earth that this atmospheric function of Nitrogen is most Vital. The cosmical Nitrogen in Nature, or on the Globe, acts therefore more usefully than the local artificial Nitrogen in the Chemist's laboratory. In Nature, in the world, and for mankind, cosmical Nitrogen is an element of extremest interest and greater importance. Nitrogen constitutes the major part of the Air Ocean of the Sky. And in the Air Ocean preside the crowned heads of cosmical Chemistry, the light and heat givers, the life givers, of the matter of the Earth—Nitrogen, Oxygen, Hydrogen, and Carbon. By constituting four-fifths of the atmosphere Nitrogen is the highest matter on Earth; and when Nitrogen deigns to descend from Heaven to Mother Earth, it is still to play the regal parts; for with Nitrogen can alone be fashioned the highest Chemical on Earth, the Human Faun, whose Mind may be a little lower than the Angels'.

Nitrogen is an element of light and heat and lightness, and possesses of all native Earthly matters, the most and the stablest positive morphigenic heat force; and Nitrogen is thereby the strongest and the most vital Element of Chemistry. Thus, at least, Nature and Organic Chemistry speak to us of Nitrogen. But not so the Chemists. They scruple not to call Nitrogen, Azote—nay, even Stickstoff or Chokestuff; and the Chemists that think best of Nitrogen only give him the credit of diluting Oxygen, or at most speak of him as producing Nitre. And because Nitrogen cannot be persuaded by any e[illegible]al artifice or local torture to show off his very gr[illegible] for t[illegible] tion of local class-rooms [illegible] to [illegible]

Nitrogen's unobtrusively priceless benefits, or his momentous work in Nature, and even in Themselves; and not satisfied with despising Nitrogen, Chemists load him with Chemical Obloquy. For to deserve much unobtrusively from Humanity is often the way to get less than little from Man.

Nitrogen and Oxygen exist in the Sky thoroughly mixed and abundant, and yet while there they seldom combine Chemically at all, and never extensively. Not because Nitrogen and Oxygen are altogether and in all conditions incapable of combining, but because both are light and capacious, and radiate in the Sky the plus and not the minus pitches of spectral Force, and conduct badly. Consequently, to combine directly in the Sky, Oxygen and Nitrogen must act by themselves, and exchange locally their own mutual morphigenic thermal forces. And in that case it is the more positive or more dilated Nitrogen that must dilate the Oxygen, and it is the more negative Oxygen that must contract the Nitrogen. But to dilate Sky Oxygen is a matter of supreme difficulty, because Oxygen in the Sky has attained, for Earth, the utmost dilatation of which its strain or character is capable. Throughout the whole compacter Earth-globe we meet much Oxygen, but no Oxygen is found whose strain, whose force, whose form, is more dilated than that of the Sky Oxygen itself. We find Oxygen always condensed, much of it liquid, much solid, and much even persolid in the Earth's Crust. The tendency of Oxygen on Earth, therefore, is rather to condense or contract than to gasify or dilate any higher than its Sky Form. Contraction is what the rest of the vast Earth is inducting upon the Sky Oxygen, and so much so that Oxygen is ozonifiable or condensable, and in these condensed states Oxygen even becomes soluble in Water, as *the peroxide* of Hydrogen; and Oxygen, in contact with Metals or Carbon, tends to solidify or to condense. It is clear, therefore, that the comparatively small dilating power of the positiveness of the Sky Nitrogen over its neighbour Oxygen, meets in Oxygen a powerful resistance to dilatation. Moreover, Oxygen is itself, when in its unmodified Sky state, a feeble form-contracting power, and the Sky Nitrogen which the Oxygen has to contract is the Element most difficult of contraction in Chemistry. In other words, the force, form, and character exchanges in oscillations are impossible between Sky Nitrogen and Oxygen, as isolated Elements: they cannot combine chemically together.

But the Earth-globe is so full of even persolid Oxygen —that Oxygen, even free condenses easily and somewhat stably into Ozone; or Oxygen is so attachable to solidity that when once Oxygen is solidified with Nitrogen, as in the Nitrate of Ammonia, Oxygen's strain can retain, in nascent states, condensation enough to hold contracted nascent Nitrogen, or to enter into combination with Nitrogen. But neither Nitrogen nor the similar charactered Halogens prove very stable partners to Oxygen, nor Oxygen to them; for both are inducting on Oxygen dilatation, which Oxygen can also take in the Air—and Oxygen is, therefore, an unstable negative.

The chemical forces, forms, characters of Oxygen and Nitrogen are positive. Any compound of Oxygen and Nitrogen, that is, any blended mean of Force and Form and Character, that can be made out of such pure or comparatively isolated Oxynitrous matter, must tend to be positive also, and to be not in itself very stable—Oxygen being an unstable negative to Nitrogen and others. The compounds of Oxygen and Nitrogen, therefore, are gaseous or gasifiables, and not very stable, and occur beautifully in the octave proportions of Oxygen—that being the best proportion for Harmony or for Combination. By the octave duplications of the Oxygen ingredient in Nitrogen compounds one capacity and the weight are increased, and the Oxynitrous compound may come to assume even the solid form as in the Nitric acid anhydrid, but with some difficulty and much instability.

On the characters and forms of some elements when free, and more or less throughout all their compounded or character modified states—the Contracting Forces of the Shapecraft can tyrannize or preponderate. On the characters and forms of other elements on the contrary—the Expanding Forcès tyrannize or preponderate. Either of these forces, however, tyrannize most on the elements that have the free, unmodified characters.

On Carbon's character and form throughout chemistry, the contracting, cooling, freezing, hardening, solidifying forces of the Shapecraft are observed more or less, but always, distinctly to act. But in Carbon's free, unmodified character, these great Contracting Forces act or tyrannize their utmost; and then they blacken and persolidify Carbon; and in none of Carbon's compounds or character modifications do we find Carbon so insoluble, so infusible, so hard, as Carbon is when free. It is, therefore, the free and not the nascent Carbons that are the most difficult to rescue from the tyranny of their favourite Contracting Force of the Shapecraft; it is the free, the persolid and most contractable Carbon, a Carbon with quite an unmodified character that is most difficult to expand or to transform or to chemicalize into shapes foreign to Carbon's free shape, which is a very contracted shape. And Carbon is, at natural temperatures, and specially in its most contracted form of the Diamond, the most inactive of chemicals.

On Nitrogen's character and form throughout Chemistry and the World, the expanding, the heating, the boiling forces of the Shapecraft, are observed, more or less but always, to act; but it is on Nitrogen's free or unmodified character that these great Expanding Forces act or tyrannize their utmost, and then they quite pergasify free Nitrogen; in none of its compounded or character-modified states do we find Nitrogen so very unliquefiably gaseous as Nitrogen is when it has the free or the unmodified character. It is, therefore, the free and not the nascent or character modified Nitrogens that are the most difficult to rescue from the tyranny of the great Expanding Forces of the Shapecraft. It is free, pergaseous, *exploded* Nitrogen that is most difficult to contract or transform or to chemicalize into shapes foreign to Nitrogen's free shape of supreme expansion. And in its sky shape and character Nitrogen has appeared to Many and even to Chemical Eyes to be next to useless on this Earth, so inactive is free Nitrogen.

In the Nascent forms of chemicals, they have modified Characters, and the utmost power or the great preponderance or tyranny of their Favourite Shapecraft's Force is broken or lessened; and Nascent chemicals, having already modified characters, are easier to chemicalize, or to modify and guide into shapes that are foreign to their own free shapes.

It is, however, the Supreme power exercised by the Contracting Shapecraft over all Carbon, and seen specially in free Carbon—as it is also the Supreme power exercised by the Expanding Shapecraft over all Nitrogen, as seen specially in free Nitrogen—that gives them their pedigree and strain or their special importance in Chemistry; although these powers may make Carbon and Nitrogen inactive when free or when under the greatest Tyranny of the forces.

CHAPTER L.

THE EXPLOSIVENESS OF THE NITROGEN COMPOUNDS.

It is evident in the atmosphere that Nitrogen belongs to that quality of matter here on Earth that is most prone to gaseity and the most tenacious of it. For a most striking feature in Nitrogen's character is the stable radiation or absorption of the high and highest pitches of the Spectral Force of the Dayshine and Nightshine, the greatest expanding force on earth, though the most unobtrusive of forces; and Nitrogen's feeble radiation, absorption and conduction of the low and lowest pitches of Spectral Force, present through the action of the Dayshine and Nightshine on the planetary Earth-matter, the great contracting force on Earth. What Carbon is for the low and lowest pitches of Spectral Force, for the Shapecraft contraction, Nitrogen is for the high and highest pitches of the Spectral Force or for the Shapecraft expansion. Nitrogen absorbs well and greedily,—that is, into ample capacity and plasticity, chiefly the blue, the violet, and the ultra-violet forces of the spectrum, the most expanding, gasifying, and unobtrusive forces in the Earth's Shapecraft. Every attribute in Nitrogen favours great and stable expansion in Nitrogen. Consequently billions of tons of free Nitrogen are always *exploded* into the very rarefied and unobtrusive gaseity of the Atmosphere by similarly unobtrusive pitches of the Spectral Force of Dayshine and Nightshine. Just as for free Carbon there is always and everywhere the greatest cooledness or contraction to be tapped from the Shapecraft, so for free Nitrogen there is always and everywhere as intense heatedness or expansions to be had from the Shapecraft.

To hold this Nitrogen contracted and unexplosive; to tame Nitrogen in a compounded state, into a condensable gas or into a liquid or into a solid, needs a very strong contracting force, needs powerful compressing centripetal motions or attractions, and, indeed, much of them. And in the Shapecraft of the world there does exist forces to bind down Nitrogen, a Samson though he be. In the Shapecraft there is gravity, and along with the high, the treble, the expanding, gasifying pitches of Spectral Force—there exists the low, the base, the solidifying contracting pitches of that Force. You can therefore coerce Nitrogen's great expansibility, its great explosiveness, its great gasifiability, its great heatableness, its powerful centrifugal movements, its lightness with the antagonistic forces or motions of contraction, centripetal motions, cooledness, solidity, weight. For example, combine or juxtapose molecularly Nitrogen with *plenty* of Carbon; which Carbon is to the low-pitched spectral force what Nitrogen is to the high-pitched, which is to heaviness what Nitrogen is to lightness, which is to solidity what Nitrogen is to gaseity, which is to centripetal motions or attractions or hardness what Nitrogen is to the centrifugal and to softness, which is to cosmical cooledness what Nitrogen is to heatedness—then it is evident that that Carbon in sufficiency, polarly and molecularly pitted against that Nitrogen and the

Nitrogen against the Carbon, will antagonize and balance each other's opposite forces and forms and characters, by converting them into a stable mean, or into an unexplosive, well-balanced Carbonitrous matter, or compound, called Cyanogen.

All Nitrogen everywhere always tends to expand *greatly* or to *explode* by its pedigree character and the Forces of the Shapecraft; but while Nitrogen is in Cyanogen, Nitrogen cannot do so to the utmost, as long as there is plenty or two equivalents of very contractable Carbon touching and coercing Nitrogen in Cyanogen, through character. All Carbon everywhere always tends to contract greatly by the dark radiation of its character and by the Forces in the Shapecraft; but while Carbon is in Cyanogen, Carbon cannot contract its utmost as long as there is the very expansible Nitrogen close to Carbon forbidding it. In other words, the contraction of the Shapecraft cannot do its worst on Carbon in Cyanogen as long as Nitrogen or its Character is blended with Carbon; and the same is true of the Shapecraft's expansion acting in Nitrogen, character blended, in Cyanogen with Carbon.

If you combine Nitrogen with plenty or with three equivalents of Hydrogen you produce Ammonia, that is, a compound of Nitrogen, Hydrogen, and the mean Earth's Forces, Form, and Character, in which compound, through the Conductivity of the Hydrogen and its force and form Reciprocity towards the Mean earth and Nitrogen itself, the cosmical cooledness or negative Force of the Earth and her Form are conveyed to the Ammonia and its Nitrogen, and Hydrogen's and Nitrogen's Force and Form are conveyed to the Mean earth; and in this compound, or in Ammonia, therefore, we have the most powerful Contracting Force, that of the Mean earth, in full action, through the full quantity of Hydrogen—and Ammonia is easily solidified, whereas Nitrogen and Hydrogen are with the very greatest difficulty liquefied. The cosmical Heatedness and the Expansion of Hydrogen and Nitrogen, derived more specially from the Sidereal pitches of the Shapecraft, are exceedingly great, but they find their match, they are balanced, by the equally strong Contraction Force found in the planetary Forces of the Mean earth. The enormous expansibility of Nitrogen is not in Ammonia checked by any contracting or negative power found in Hydrogen by itself, but by that negative force and form that the conductivity and force and form reciprocity of a large amount of Hydrogen brings largely from the Mean earth's stores. And Ammonia's Force and Form being bound to Earth is stable and unexplosive.

It is very different if you try to hold in Nitrogen's explosiveness, that is, its heatedness, its expansibility, its centrifugal motions—by bad conducting, bad dark radiating, bad force and form reciprocators to the Mean earth, such as Iodine or Chlorine. Chlorine and Iodine are themselves negative to Nitrogen in several respects, in weight, in the heatable and coolable capacity; it follows, therefore, that Chlorine can be negative to Nitrogen, but only with their own local and consequently feeble negativeness, because Iodine and Chlorine do not conduct, do not radiate darkly, do not so well form and force reciprocate towards the Mean earth. In exceptional and quite local and very artificial circumstances or Shapecrafts, therefore, Chlorine or Iodine may combine with Nitrogen, and very indirectly into the Chloride or Iodide of Nitrogen. And these Chlorides and Iodides brought from the Artificial to face the Natural Shapecraft cannot be confirmed or ratified or adopted by the

Shapecraft of Nature. For in these Chlorides the two antagonistic forces of the Shapecraft are badly matched; an intense, exploding, expanding, gasifying force is acting on Nitrogen, and also on the Chlorine, and also on the very volatile Iodine, with a cosmical power; and to balance the cosmical expanding force we have only the local, the feeble negativeness or contraction given by the Chlorine and Iodine comparatively isolatedly. Consequently those high-pitched cosmical spectral forces in Dayshine and Nightshine that we see unobtrusively gasifying and exploding daily and nightly billions of tons of Nitrogen in our air, meeting in the few ounces or pounds of the Chloride or Iodide of Nitrogen easy admission and but trifling and local opposition from the antagonistic forces lodged merely in the Chlorine or Iodine—explode easily and greatly all the ingredients of the Chloride or Iodide of Nitrogen.

In the Organic or Vegetable Alcaloids, say Morphia ($C_{34}\ H_{19}\ O_6\ N + 2\ HO$)*, we observe that Nitrogen and Oxygen, but specially the Nitrogen, that is, the most purely positive or form expanding element, enter, and that the very solidifiable or form contracting Carbon and the conductive potentially negative Hydrogen enter also; and the Carbon and the Hydrogen enter in much larger quantities as compared with Oxygen, and most specially with the Nitrogen. The above proportions in the ingredients of the Alcaloids being needed to make the Alcaloids stable and unexplosive, just as a large quantity of Carbon is needed in Cyanogen, and a large quantity of Hydrogen is needed in Ammonia to make Cyanogen and Ammonia stable and unexplosive.

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* I retain the oldest formulas until chemists make up their minds about them, or cease changing them.

In the Nitrogenous, Organic compound called Trinitroglycerine, from which Dynamite is made, Nitrogen enters, and also Carbon, but the Carbon in comparatively small quantity, or in equal equivalents with the Nitrogen. And that signifies that in Trinitroglycerine the two antagonistic, or the two balancing, Forces of the Shapecraft, the Explosive Force, represented by the Nitrogen, on the one hand, and the anti-Explosive Force, represented by Carbon and Hydrogen, on the other, are inadequately matched. On Nitrogen, the high, unobtrusive expanding pitches of Spectral Force have enormous power, but through none other of the ingredients of Trinitroglycerine has the low, contracting Spectral Force a sufficiency of power to bind down steadily and strongly the expanding power acting on Nitrogen. Hence, through the Scantiness of the Carbon in Trinitroglycerine, it becomes a badly balanced compound, unstable or explosively decomposable by the ever present, though unobtrusive, Forces of the Shapecraft; as is also Gun-cotton for like reasons.

The Force that dilates, gasifies, explodes all these unstable Nitrogenous compounds does not clashingly originate in the few grains or pounds of matter seemingly the sole actors in the explosion. The Force is cosmical, it is the Sun force, the Star force of the Universe, a power so vast that it has shaped with the smallest effort the whole World, by exploding tons upon tons the sky of Nitrogen into that Atmospheric Ocean that cases the Earth-globe. A Force, therefore, that shall have Might enough to dilate and to explode, with sportive ease, all the Dynamite that is made by Man.

CHAPTER LI.

THE CONSERVATION OF FORCE, MATTER, FORM, AND LAW OR FORETHOUGHT.

WE are conscious of Matter; we are conscious of Motions or Forces about that matter; we are conscious of FORM, or Thought, or Order, or Plan, or Laws in the forming and behaviour of that matter and that force. Form, Forethought, Plan, Order, Law, exist in our consciousness, as well as the force or the matter itself. And Chaos or utter confusion alone can sunder matter and force from form or thought-plan. THOUGHT, therefore, is no underling in Creation—and on Earth *this* Thought is the Prerogative of Man. And even in feeble Man his Thought is strong, or is a Talisman that commands because it interprets Form, Force, and Matter. Assuredly Man's physical importance in the Universe, weighed by his own size and the size of his Earthly Home, is well-nigh the smallest of the small. But by Thought Man may see the loom-form of the very Universe, and Man then is great. And if physical Man, a speck in place, in time, a dweller in a speck of the Universe matter, is thus vouchsafed the Thought that grasps and overtops or prompts Force and Matter, surely in the Vast Universe there may live grander Thinkers, Beings that do more than Man, and a BEING that does most—a FIRST THOUGHT and Cause and Former of all. But as even the tiny Earth-globe has its allotted place in the Family of the vast Skies or Universe, so I trust that the tiny, childlike Forethought in Man may be akin to all the Thought in Heaven, and even to the Omnipotent Father-thought of the Universe. And because Thought and Forethought are essential to matter and force while formed, they All Live or die for ever.

Slowly we awake, and, indeed, from the grave-like Darkness of the nightfall to the lustre of the stars, or to know that in Creation there is not only the Earth Speck of matter, but a Universe of matter. Slowly we come to know, and by the Grave-like Darkness also, that there is not only a Speck of Earth-fire, but a Universe of starry fire—that there is not only a Speck of time, but Eternity. And not only so, but I trust that we yet shall come to know, mayhap through the Death and Grave darkness also, that not one Speck of Man-Thought alone exists, but also Infinite Thought, from Man, through Angels and Archangels, up to the GOD of the Universe; and that like matter, like force, THOUGHT is kin throughout the One Universe, and worships, crying Abba, the Centre Thought of Creation.

For if our Specks of matter evanishing from us perish not, if the Phœnix fires are quenched to burn for ever, if passing Time leaves an Eternity behind, and if Form dies not, but only transforms, I trust that it shall not be Thought alone that is doomed to die the Utter Death.—For one all-wise, one all-loving, one almighty WILL—hallowed be its name—has planned, has fashioned and sustains the One Universe, for ever and for ever.

CHAPTER LII.

THE GEOLOGICAL AND THE CHEMICAL THEORIES.

In a Theory of Chemistry that treats much of a Cosmical Chemistry, Geology cannot be wholly overlooked. And in Geology, indeed, may lurk even the Theory's death-blow. I man myself, therefore, however small my powers, my resources, and my time, to steer this Theory clear of the geological fires and rocks.

The orthodox Theories of geology consider chiefly the Earth's Crust and Watery ocean, and much neglect the Earth's more unobtrusive Air Ocean or Atmosphere, and those Theories consider that crust and that watery ocean more in their Mechanical than in their Chemical bearings or aspects; further Geological Theories consider the startling, volcanic, seemingly central fires far more than the more commonplace, external Dayshine and Nightshine fires around the Earth. I submit, however, that the Earth's Atmosphere, that Chemistry, that the External fires of sun and stars, and planets are no Aliens or Underlings in the doings of past Geology, since they are in no wise Aliens or Underlings in the present doings of the World or of Geology.

So striking are the marks or scars of Fire in the past and present history of the Earth, that all Geological as well as Chemical Theories must treat of Fire, and the only questions that can arise are about the Source of this fire.

The present Geological Theory begins with the hypothesis of an Earth-globe whilom wholly fire-fused and molten. But to fuse the whole Earth-globe, as Geological Theory does, from its centre to its periphery, however easy in Theory, is very difficult in Fact, or needs a very Enormous Fire Force. Having, however, thus invoked a VERY vast fire force from Nothing, Geological Theory goes on to say that this mighty force that fused or moltened a whole Earth-globe, cooled away gradually into Space from the Earth's surface, where there was thereby formed a cooled, superficial, egg-shell crust over an internal white hot melted mass which now persists under the crust and serves to give us very little else beyond volcanic fires and the earthquakes, or the upheavals of the land storms of the Earth's crust. In other words, Geological Theory conceives an ENORMOUS fire force of unknown antecedents, or creates from nothing a vast force fated to fade in part to nothing, or to be lost in Space—a vast force, therefore, in its greatest part useless or lying idle for years within the Earth's shell-crust, simply waiting to be lost or cooled, or in trifling parts destined here and there—and now and then—to be busy in volcanic mischiefs. A VAST, *foundling* Fire-force, however, created from nothing, lost into nothing, and the greatest part of which is nearly idle, and whose sparse and short acts are mischief—has to me so much of Contraband that it cannot be smuggled into the Domains of Science without strict search, and at our utmost need. And as a Searcher assuredly there is none better than Mathematics, and the Authority of Sir W.

Thomson and others declares that Mathematics are against the internal fluidity or moltenness of the Earth-globe. And lastly I venture to hope that this vast Central fire force, unmathematical, hypothetical, unnatural, can be displaced in Geological Theory by vast External fire-forces, the Dayshine and Nightshine, which are not unmathematical, which are real and quite natural.

For this every-day World, the present, the actual Earth-globe is at this very hour, itself perceptibly quite fire-moltened enough for all the purposes of Geological Fire-Theory—but *peripherally*, and not *centrally*—and by the innumerable External very visible Sidereal and Planetary Fires that assuredly give us the Dayshine and the Nightshine, and not by any Central Fire. The present Earth-globe's periphery has the dilated, softened, dissolved solidities of its Soil, Strata, Flora, and Fauna, has Oceans of moltened waters, and is wholly encased by a *forty-miles-deep* Air Ocean, and the whole peripheral Globe is in incessant, enormous Chemical actions—the peripheral Earth-globe, therefore, is *more* than molten, it is gasified and intensely Chemically active. And I submit that the Fire Heat needed to dilate, to soften, to liquefy, to seethe or gasify, to chemicalize the Earth-globe's peripheral soils, strata, flora, fauna, waters, airs, and to carry on the unceasing enormous chemical works of Nature, is not so very trifling as to be utterly ignored or disregarded in any Geological Fire-Theory—as to be totally extinguished in Theory by the Central Fire Force.

But Man ignores easily the intensely heated state of the Peripheral Earth, and indeed of himself, because he was born in it and to it, and lives in constant familiarity with it, and actually belongs to it, and it to him; for Salamander-like, he cannot live out of its flame. Moreover, it is the perfection of a Cosmical Force; or it is a force *equitably* shared by him with all things, for it is a force taken and appropriated by character, or by the CHOICE of matter and of himself; and since everyone has had his own choice, he is therewith content, and there is no snatching necessary at the force of others. And Man therefore overlooks those intense Cosmical *Molecular* or fire motions as easily as he overlooks even the vast, cosmical, *Molar* motions of the Earth-globe, about its Axis and around its Sun.

But I submit that the Earth-globe cannot carry on its unceasing and enormous chemical works without much fire: the vast mass of the Earth's potentially solid airs cannot be seethed or gasified, cannot be raised to steams of most wonderful high pressures, without much fire; the vast mass of the Earth's potentially solid waters cannot be moltened or liquefied without much heat; the Earth's flora and fauna cannot be kept dilated, alive, and chemicalized without much heat; nor, indeed, even the Earth's humbler soils and land strata.

And whence this heat?

Not, I submit, directly from the Central Earth. No heat that comes to us from below bears any comparison with the heat that comes to us from above; hence this deep-coming volcanic heat regurgitating from below, is, I submit, the excess of the heat that has penetrated from above. For the Airs and the Waters of the Earth, integrals of the Earth's other peripheral masses, cannot be seething and moltened by the Dayshine and Nightshine fire without imparting a Fire-heat share to the rest of the integral Earth's periphery—a share of fire, we submit, sufficient to explain volcanic fires and phenomena, from known external sources, or from *veræ causæ* rather than from unknown internal hypothetical and questionable sources. And if we have volcanic fire coming out of the bosom of the Earth's crust, we have also a lightning fire as strong, as terrible, and more frequent coming out of the bosom of the Earth's watery air. And if we have earthquakes or landquakes, or mischievous storms on the Earth's crust, we have also, and much oftener, *airquakes*, *waterquakes*, or mischievous wind and ocean storms. These terrible but occasional wind and ocean storms, and the more unceasing beneficent Chemical Works of Nature, are traceable to the fires kindled by the Sun and Stars—and the earthquakes and earth fires are not so utterly different from the airquakes and air fires, and from the oceanquakes, as to render impossible their common causation, as to render impossible the explanation of earthquakes and earth fires by passing disturbances of the equilibria of Terrestrial and Sidereal shine powers without any central fires. If we have enough of fire or of positive shine power from the Sun and Stars to give the Earth the Flame of Life, the vast constant chemicalization of the Earth, the softness and solution of the soil and the stratified rocks of Earth, the moltenness, the currents, the storms of the Waters of the Earth, the Gaseity and the currents and the storms and the fires of Air, I submit that we have enough of fire from the same Sun and Star source to account for the lesser Volcanic Fires and Motions on the Earth's more sluggish crust. And for all the fire employed on Earth, for Geology and all things, there is no *Deus ex machinâ* needed; that is this Theory asks for the Fire Force from the familiar genial, the unquestionable Dayshine and Nightshine fire, and not from a Deus Vulcan, or any Cyclop central fires.

In other words, by far the best Type of fire we consider to be the Dayshine and Nightshine, no unknown Demon, but a familiar and valued Friend: for it is a fire resolvable into the Spectral Force, that is, into a pulse in Ether and Ethero Molecular Matter, a heat which has not only the *mechanical* equivalent, but also the *form* equivalent. Heat, therefore, is the Spectral Force, or an Oscillatory Motion that begins, as it were, in Ether and in the Ethero Molecules of matter, and thence may pass into Molar Matter. And as the type of form found in the Molecules of matter is often maintained even in the Molar form of matter, so is the Oscillatory type of Motion found in the Ethero Molecules of matter, and called Heat, often maintained in the Molar Motions of the matter of the Earth; that is, the Oscillating type of motion necessarily unobtrusive while occurring in *Molecules*, is more evident in *Molar* motions, and prevails in the machines or mechanisms both of Nature and of Art, as seen in the sea-beach waves, etc. Nay, even Man himself is a bundle of Oscillatory motions, both *molecular and molar.* Man is a light, dilated, heated solid, and is therefore thrilling with the Ethereal and Ethero Molecular Pulses of the Heat of Life throughout his frame. Man is made of right and left halves or of a positive and negative half, which when Man walks or runs or moves molarly, swing or oscillate from side to side—from positive to negative, and *vice versâ*. Man breathes oscillatingly, or negative matter out and positive matter in. Man's blood flows, venous or negative, arterial or positive, in oscillations with his Heart and Pulse beats. The procreative, automatic motions or Orgasms are oscillatory, etc.—and in the machines of Art progressive or the continuous motion is obtained by oscillations.

We repeat. Heat is Motion, and is Quintessential Form also. And in those parts of Earth that most and best move, *even molarly*, lodge the highest Heat and Form on Earth. And those parts are the Earth's Gases or Airs, her Liquids, or her surface and ocean Waters, and their Kindred the heated and dilated, living Solids, or the Fauna and Flora, and their more immediate belongings, the Soil and the most Superficial Rocks of Earth. And the gaseous or most heated part of Earth, her Air Ocean, moves most and remains on her extremest periphery, and is thereby nearest to the shine powers or to the plus fires of the Sun and Stars, and is farthest from the earth's Centre. And up in the Air Ocean fly swiftest the most heated Solids of Earth, the Birds, seeking, as it were, their kindred element and motion; and in the lower Air Ocean, move slower, the higher Fauna, the next heated, the next moving Solids of Earth. And in the commingled mixture of the Air with the Water ocean, live and move slowest, the lowest Fauna, or the Fish, the next heated Solids of the Earth. And in the commingled mixture of the Air, the Waters and the Softer Solids of the land, live the Plants, branching down into the dark, soft, moist, solid Earth, and branching upwards also into the lighted, moist, Gaseous earth or Air—and the Plants are the next heated and the next movers on the landscapes of Earth; then follow the soft, moist loamy Soils; and then the Stratified Rocks, and they move slower still; and lastly are reached the deep primary Unstratified Rocks, those nearest the earth's Centre, and in Them life ceases, and great, and least-moving or most sluggish Solidity, prevails. Heat, light, softness, liquidity, gaseity, life motion, on Earth—part from the Sun and Stars, cold shade, hardness, solidity, lifelessness, stillness—part from the earth's Centre. And these great facts, things, and motions, to my mind, constitute more trustworthy and decisive Indications of True heat or cold than the measuring of the Temperature of the Depths of mines or Artesian wells with Thermometers. When we penetrate deep into the earth's Crust what we know gets stronger and stronger is by no means True heat, but Gravity, or Pressure, the *deadliest* Antagonist to True Heat, whose very essence is Expansion. And except a little Thermometric heat, developed in deepening matter by this increasing Gravity, or Pressure, we find as we sink into the earth's Crust-depths, darkness, solidity, stillness, lifelessness, that is, True Cold and less and less of True Heat.

We repeat. If the Central Fires of Earth exist, they exist greatly but to little purpose, or they are, indeed, perfect idlers, when not worse, or when not destructive. Heat-work of the best goes on over Earth all the better the farther it is from these Central Fires. For whenever these Central Fires are seen or supposed to be seen, they are very destructive. Those Fires, therefore, are disturbance, and the Earth is better after those Fires than with them, and I venture, therefore, to think that Theory shall be so also.

But it is Characteristic of Man to make much of the Malignity he fears, and little of the Beneficence he enjoys. Man finds and worships the Evil spirit sooner than Our Father which is in Heaven. We are all most apt to give all Honour to a Central Fire of which few in a lifetime see even a Spark; and we all but forget the glorious Dayshine and Nightshine in which we all bask ever and move and have our Being; for we fail ever to see the Wonderful in the Common.

Volcanics, therefore, seem to me Storms in the earth's Solids, analogous to the Storms familiar to us in the Earth's Fluids, and all these Storms are traceable, therefore, to a like Cause, or to the familiar External Fires of the Dayshine and Nightshine.

CHAPTER LIII.

GEOLOGY OF THE ATMOSPHERE.

THE Lands, the Waters, the Airs of Earth, are by no means sharply distinct or separate from each other—they all freely intermingle in oscillations. It seems to me, therefore, unsafe and unscientific to theorize on the Earth's Crust and Waters alone, to the exclusion of the Airs of Earth; but this is what Geological Theory has hitherto done.

The matter that exists in air is found also in the waters, in the lands, in the fauna and flora of Earth. And the matters found in land, waters, fauna and flora may appear likewise in the Air. Moreover, matters that are up in the sky air are constantly descending down into the waters, into the living and even into the dead, solids of the Earth. And matters that have been down in the solids and waters of the Earth are constantly ascending up into the sky air. This ascent of matters from Earth to Air, and this descent of matters from Air to Earth, oscillate, and are of most signal moment in the history of the Earth-globe, past, present, and to come. For example, Carbonic Acid is now constantly rising into the air from a breathing, solid, living part of Earth; and Carbonic Acid is also constantly falling down from the air, as wood, into another solid, living part of Earth; not unlike the cyclical cloud-rise and rainfall of the Waters of the Earth.

And this falling earthwards and rising airwards of Carbonic Acid has not always been what it is now. For we know that the quantity of Carbonic Acid has been much greater in the Air, during certain geological epochs of the Earth's history. And whenever Carbonic Acid accumulates greatly in the Air, we have an atmosphere that absorbs and surfeits lower pitches of the Spectral Force of Dayshine and Nightshine than our present atmosphere does. And we shall have thereby a very warm atmosphere for all the Globe;* and with that we shall have a cloudy, rainy atmosphere for all the Globe; we shall have a moist and quite tropical Climate throughout an Earth which her atmosphere wholly wraps and cases; we shall have all the requisites for a gigantic, luxuriant, cosmopolitan, tropical vegetation, on such an Earth; and with that we shall also have a corresponding terrestrial fauna. All this and more shall we obtain without invoking even a single spark of Central Earth-fire, but through the agency of that Sun and Starshine power that we and the Earth herself have from our Cradle known and loved. And to surcharge the Earth's sky air again with Carbonic Acid we have only to burn all the coal and rock-oil beds on Earth and to decompose all the limestone rocks of Earth. And if that were done we would gradually restore a pre-Adamite aspect, first to our Air and then to our Earth, not, indeed, without accompanying fires—for you cannot change or transform the aspect of matter locally or cosmically without producing fire. There cannot be a reciprocative exchange of the Forces and Forms of the land and air of the Earth-globe without commotions and fire; which fire, however, it is not absolutely necessary to attribute to Vulcan's Cyclops, or to the Central Fires, but to the diurnal Sun and Stars of Heaven.

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* Tyndall on "Heat," p. 417.

The whilom Earth before the coal and rock-oil beds were formed—but were forming—ere yet her limestone rocks were formed—but were forming—had an atmosphere surcharged with Carbonic Acid, and therewith and thereby had throughout a warm, cloudy, moist, tropical Climate, which, with the abounding sky Carbonic Acid, facilitated greatly the development and growth of a peculiar and Gigantic Flora, and of a Gigantic Fauna to feed on the Flora; and the Waters of the Earth were at that Age displaced and located more into the Air and into the Gigantic Flora and the Fauna, and there was therefore less Water to spread over the face of the Earth. There was of necessity at those epochs of the Earth's life, a different distribution of the Waters, and a very different Flora, and a different Flora-eating Fauna, for it was the pre-Adamite Earth. When coal, rock-oil, and limestone were formed, it was at the expense of the surcharging sky Carbonic Acid, and of the Waters located in Vitalities and in sky Air. The Air carbonic acid descended from the Sky Earthwards to become coal, rock-oil, carbonate of lime—and the Waters located in perishing Gigantic Life, and in the sky, also descended and spread as floods, and changed the distributions of the Waters over the face of the Globe. Nor could these Phenomena happen unless with much dislocation, passage, and exchange of the fire and form force, throughout much of the peripheral Earth; but all happened, as it appears to me, without even so much as leave-asking from Vulcan's Cyclops or from the Central Fires.

To recapitulate. I submit that a considerable Change of the quantity of Carbonic Acid in the Sky Air, leads to a Change in the shine powers or spectral force of the Earth's Air Ocean, which has distinct effects on the forces and forms of the Earth's Waters, Fauna, Flora, soluble and stratifiable Rocks, that is, has a pronounced Volcanic and Geological effect on the Earth-globe. And moreover we know that such changes in Carbonic acid have occurred and are occurring in the World's history.

As we know that it is possible for the Earth to have more of Carbonic Acid in her Air than at present with correlated results, we may infer that it is also possible for the Earth to have less Carbonic Acid in her Air than now. And that would lead to Glacial Epochs in the World's history. And if we conceive the Earth-globe in Eternity, we may note that its history, like its motions, like its light and heat, and like its lives, consists in many long and short Cyclical Oscillations, but not in Utter Death, but rather reaching ever with each Cycle higher and higher Developments or Improvements in life and loveliness.

CHAPTER LIV.

THE POLARITY OF FORCE.

Two august forces or motions swing or oscillate in Nature, throughout the utmost ken of Mind. No matter is too great, too small—too dense, too rarefied—for their omnipotent and gentle grasp. These august motions are everywhere, and in all time, in the tiniest Atom, as well as in the vast masses in the Universe; they may be slow like an eternity, or in billions of throbs in a lightning flash. They have many names, for they have many guises and disguises. In philosophical ultimates, however, they are centripetal and centrifugal motions, in molar matter, in ether, and in ethero-molecular matter, oscillating with each other. For a single one of either of the motions, unmated from the other, would bring disorder, or swift destruction on Creation; it is the double, wedlocked, swinging motions, it is the two forces in polar oscillations that bring order to chaos, and stability to an Atomy or to a Universe. In Astronomy these two forces or motions, the centripetal and the centrifugal, are seen bandying between them, the vast globes of our planets, and their sun, into the orbital shapes or courses. Nay, those mighty forces bandy into orbital shapes even the far greater masses of the resolved Nebulæ. But in the astronomical shape or orbit the Centripetal is always tied to the suitable Centrifugal force or motion, and *vice versâ.* One motion never rules in astronomy or in an orbit, without the suitable other.—But those motions not only bandy vast globes into the orbit pulse or shape, but also the thin Ether into the pulse of Light, and in Light there is no fit of easy transmission or centrifugal impulse, without the suitable fit of easy reflexion or recoil or centripetal motion, in Ether; there is no Advance wave without the Recoil wave. And in the heat motions or forces, and in the electric motions or forces, and in the form and colour pulse motions—it is the same. No expansion or gaseity can exist in any Form without some alloy of solidity—nor is there any contraction or solidity in a Form, unaccompanied by some gaseity or expansion.

But although neither of these two forces can be extinguished in matter, since they are there always Polarly oscillating, still the rapidity and length of their oscillations vary much in matter, and there arise consequently other phases of these forces or motions, which can also be paired off in doubles :—

No plus without the minus electric force.
No heat without cold, nor light without shade.
No trebles without basses.
No male without the female force.
No life without death, etc., etc.
And *vice versâ.*

When called Chemistry these beneficent forces oscillate in the forms and beauty of the World. In Physiology these forces are life in death or death in life; they are the masculine or the plus-moving spermatozoidal force, matched with the feminine minus-moving or stiller ovum force.

And these forces likewise sing in all the Music and the sounds of Earth. Nay, it would seem that all motion phenomena could be construed into guises and disguises of these forces.

It seems to me, therefore, as it has seemed to a better, or to Grove,* that chemical or even scientific thought as now is, tends too much to separate things that are inseparable, and to isolate to atoms, to molecules, and to laboratories forces and things that are unified in the One Universe.

The chemist speaks of Heat as a *separate*, or as apart from Cold; he speaks of Heat and Cold as if they could be parted from the forms and from the electricities of matter. He speaks of Sunshine power as if it were unwedded to the Earthshine power; he speaks of Atoms as if separable from the Quintessential Form, and from the Molecules, and from their Mother Earth. He speaks of the Earth herself apart from the Sun, and of that Sun without the Starry Universe. But assuredly such forces and such things are never seen or known to be sundered in Nature. And what Nature has thus joined together the Thinker must sometimes join also, or cannot for ever sunder, except at the risk of casting confusion on simplicity and mutilation on perfect symmetry. And although the Pink of Sciolists, although alone, although in a Bœotia of Science,† still I submit that in some Chemical Actions not only the Forces of the celebrated *Atom* and *Molecule* participate, but also the Forces of the *greater Earth*. For we may at any time, without let or hindrance, see the Forces developed by Metallic Metalloidations in the Galvanic

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* Grove's "Correlation of Physical Forces."

† Bahia, Brazil.

Batteries in London overspread the Wide World with thought-like fleetness; and if deftly traced by the intellect, we may note These Forces reaching farther, or attaining the matter of the Sun—and ending, indeed, only in the confines of the Starry Universe—for beyond, or in the Holy of Holies, Science lingers downcast and vails her powers and gaze: and there we can only enter kneeling, led by our High Priest.

CHAPTER LV.

CHEMICAL AFFINITIES.

CHEMICAL Affinity may be absent, and it may be present in various forms and degrees. And to understand Chemical Affinities, you must first understand Chemical Action itself; and that action we have considered to be an oscillatory ethero molecular dislocation, passage and stable exchange, of force, form, and character, between two sets of Actors : one set being always positive or in more direct or preponderant touch with the sidereal Shine Powers of the Shapecraft, and the other set being always negative and in more or less direct or preponderant touch with the unobtrusive mean Earth's contracting and minus planetary shine powers, or plus gravity and cosmical cold. The force, form, and character of the two opposite sets of Chemical Actors, obtrusive and unobtrusive, decide the quality of their mutual Actions and their Affinities. And Chemical action being very rapid, ethereal and ethero molecular movements between two sets of actors occurs best where one set or both sets are fluid, or made fluid; for fluidity increases and facilitates the molecular movements of the actors.

There exist, however, elements on Earth, such as

Platinum and Nitrogen, the force, form, and character of which are antipodes that can never meet or mingle. The forces, forms, and characters of Platinum on the one hand, and of Nitrogen on the other, are in all points diametrically opposites, or greatly unreciprocating. The capacities of Nitrogen contrast intensely with the capacities of Platinum, or are as 4·7 to 98. Great lightness in Nitrogen contrasts with great weight in Platinum, plasticity contrasts with unplasticity, perfect fusibility with the most imperfect fusibility, and very bad with good conductions. Such two Forms, such two Forces, such two Characters are throughout the compass of their range or strain on Earth—Incompatibles : they never can enter into mutual oscillations together, either directly or indirectly, or even in their nascent or with their improved or modified Characters ; and much less when they are Free, or have their strongest and pedigree Character. Under no circumstances can the Contracting forces of the Shapecraft so far loosen their preponderating grasp on very Contractible Platinum as to make it a fit mate for Nitrogen's Excessive Expansibilities. In no circumstances can the Expanding forces of the Shapecraft so far loosen their preponderating grasp on very Dilatable Nitrogen as to make it a fit mate for Platinum's Excessive Contractilities. Between Nitrogen and Platinum the true Chemical Affinities or reciprocating Combining Powers are awanting.

When, therefore, there is very great contrast *on all points* between the force, form, and character of a Positive and Negative Chemical, the two Chemicals cannot combine, neither indirectly or nascent nor directly. And if combination consist essentially of molecular motion, the fault of incompetency must be laid on the Negative.

You cannot drive molecular matter with the strain and pedigree of slow, heavy Platinum by the momentum of the swift motions of matter with the strain and pedigree of swift Nitrogen; but it is *Platinum* and not Nitrogen that is the sluggard and to blame.

When the characters between two Chemicals agree or reciprocate well, and there exists only a very great contrast between their forces and forms, as between Carbon and Hydrogen, then although the two Chemicals may not combine *directly* easily, still they can be brought easily into many *indirect* combinations.

Free Carbon is infusibly solid. Free Hydrogen is all but unliquefiably gaseous. Free Carbon, therefore, differs from free Hydrogen in force and form, in expansion or contraction, as widely as it is possible on this Earth; and consequently the electric-like selective attraction between Carbon and Hydrogen is the greatest on Earth, and they can be wedlocked very fast by it; and there is, therefore, also the widest form-gap and range between Hydrogen and Carbon, along which Carbon can ascend and Hydrogen descend, and, meeting, can oscillate in many shades of Form and Colour Pulses; or along which many Hydro-carbon compounds can be formed. For this very great force and form difference between Hydrogen and Carbon is not accompanied by a Character Difference, but by an eminent Character Reciprocity between Hydrogen and Carbon. The storing capacity is the greatest known in Carbon and in Hydrogen, being three in carbon and one in hydrogen. In this most important attribute of character Hydrogen and Carbon are the best matched pair in Chemistry; of all Chemicals, therefore, their capacities reciprocate the best. Carbon conducts and radiates Heat, and is itself Cosmically Cold or contracted, or solicits, and by capacity appropriates that Heat; Hydrogen conducts Cold, and is itself Cosmically-heated or expanded and solicits, and by capacity appropriates that Cold; Hydrogen is Cold-plastic or can sink, though not very deeply, in form; Carbon is Heat-plastic or can rise highly in form. At all the most important thermal points the characters of Carbon and Hydrogen reciprocate perfectly; and, lastly, Carbon is not so heavy as to lose weight reciprocity to the lightness of Hydrogen, and *vice versâ*. No duality of matter, therefore, can at all approach Carbon and Hydrogen in their powers of oscillations or combinations, as is clearly attested by the numerous Hydro-carbons.

We see that there is a very great Contracting power in Carbon by its hardness and infusibility, and because the Strain of Carbon coerces perfectly the enormous Expansion Strain of the Organic Gases—in the Organic Compounds. We see that the Expansion power of Hydrogen is very great by its extreme softness and unsolidifiability, and because the Strain of this Hydrogen power coerces most perfectly the Contraction of the Carbon Strain—in the Hydro-carbons. When, therefore, contraction for Carbon and expansion for Hydrogen act their utmost, as they do when Carbon and Hydrogen are free, they are all but invincible; that is, Carbon and Hydrogen have but small *direct* Affinity. Hydrogen can only with extreme difficulty expand the Carbons into Form Oscillations with it, can only combine directly with Carbons when aided by the incandescence of the Voltaic Arc.

If the Force, Form, and Character between two sets of chemicals be very assimilated or assimilable, the two sets combine directly, with ease, but without violence, without much metamorphosis, without much fixity of combination. Such sets of chemicals have the facile direct affinity. And metal with metal, or Alloyers—and Halogen with Halogen—afford the types of this kind of affinity.

The Halogens, as a group, have high pitched forms, and have an assimilated character, or assimilable force and form; and the Halogens, therefore, have between themselves the facile direct affinity or the proclivity to ready combinations. But the intra-halogenic combinations, though facile, are feeble in the sense of being easily decomposable, and are also undisguising. The Halogens conduct and dark radiate badly, and reciprocate less towards the Mean earth. Consequently Halogens acting with Halogens, act mostly by themselves, or are the chief positives or form expanders, and negative or form contractors, to each other's combinations. That is the Halogens are comparatively local actors, and the cosmical contracting power of the Mean earth does not so powerfully act on them when in mutual actions; and the Halogens, therefore, combine easily, without much violence, without much disguising form change. Since a local negative or form contractor, in a combination, is much weaker than a more cosmical one, such as the Mean earth, which would have been obtained had the Halogen actors better radiated, better conducted, better reciprocated the mean Earth's Force, Form, and Character.

Contact and partnership with Metals, however, give this earthward radiation, conduction, reciprocity, this very strong cosmical form contraction from the Mean earth to the Halogens, and will, therefore, easily decompose the intra-halogenic compounds, producing by the decomposition the more stable or contracted Haloid of the Metals.

he intra-metallic compounds or alloys are in these
ects analogous to the intra-halogenic compounds.
ys also result from local actions between actors of
milated Force, Form, and Character. The intra-
genic and intra-metallic compounds are chemical
pring that seem liker their Pedigree than other com-
nd Offspring, because in these compounds both the
itive, or father, and the negative, or mother, part or
or are similar, and are distinctly before us, or are
rusive, and act by themselves or breed in and in. The
pounds that seem unlike their Pedigree have the
ent, direct affinity, and the negative, or mother, actor
he Mean Earth, which is unobtrusive, and thereby her
in in the offspring or compound is unobtrusive or
ked also. For I submit that all Chemical Children or
pounds are like their Parents, or have the Strain of
ir ingredients, if Pedigree be rightly known, or dis-
uished, or traced.

he direct affinity between sets of chemicals exists
n the Forces, Forms, and Characters of the sets are
too distant from their mean. Nitrogen, Oxygen,
orine are gases that are Force and Form disequi-
ized to Antimony and Platinum, which are both solids.
these three gases, Nitrogen with the most difficulty
efies and solidifies, and Oxygen next; and of the
e, Chlorine most easily liquefies and solidifies. Hence
orine, of the three gases, has the strain or pitch of
ce and Form the nearest to that of Antimony and
tinum. And as Antimony liquefies and gasifies more
dily than Platinum, Antimony has the Force and Form
h or strain nearer to Chlorine and the gases than
tinum. Chlorine assumes more readily with prepon-
ant cold, the solid Force and Form; and Antimony

more readily assumes, with preponderant heat, the gaseous Force and Form; and Chlorine represents to Antimony cosmical heat, and Antimony to Chlorine cosmical cold. Among those five chemicals, Nitrogen, Oxygen, Chlorine, Antimony, Platinum, the best direct affinity, or the Force, Form, and Character, oscillating power exists between the Antimony and Chlorine. And if the Antimony be powdered and thrown into Chlorine gas, we have at once or directly the Force, Form, and Character oscillation, amid Ether, between Chlorine and Antimony, or the *two* burn or combine into the terchloride of Antimony—giving us an example of the Direct Violent Affinity. The direct affinity exists between Chlorine and Antimony, because the *two* are within easy Force, Form, and Character oscillation distance of each other, or, electrically speaking, within spark striking distance; the Force, Form, and Character of the two are not too far from a mean of themselves and the Shapecraft Forces of the Earth. And if you widen this distance between their Forces, Forms, and Characters by cooling them in a strong freezing mixture, you suspend the direct affinity between them. For by heating an element, or by cooling it, you modify its Force, Form, and Character. You may by freezing decrease and by heating increase thermal capacity, plasticity, radiation, conductivity. Cooled or frozen Antimony approaches greater force negativeness or contraction-power, frozen Antimony approaches to persolidity, and its character to greater contractilities or solidifiabilities. Consequently the Force, Form, and Character of cooled Antimony recede from those of Chlorine beyond the point at which direct or easy Force, Form, and Character oscillations or exchanges and equilibration between Chlorine and Antimony can occur, that is, the direct affinity of cooled or frozen Antimony and Chlorine becomes abeyant. A similar suspension of the direct affinity will occur if you make Chlorine's Force, Form, and Character recede from those of Antimony. If you make Chlorine lighter, more expanded, more unliquefiable, more capacious, more dilatable, and then offer such a Chlorine to Antimony, then the Antimony's weight, capacity, dilatability may not be able directly to oscillate up to a mean so high as that of such a Chlorine, and the direct affinity between such Chlorine and Antimony would be suspended. And you virtually make such an offer if you present the gas Oxygen to Antimony instead of Chlorine for combination. For Oxygen is lighter, more gaseous, more capacious, more unliquefiable than Chlorine, and consequently Oxygen is further in Force, Form, and Character from a mean with Antimony than Chlorine; and hence Oxygen has no direct affinity for common Antimony. But if you offer to the gas Oxygen not the common, but an Antimony that is strongly heated, and thereby made specifically lighter, more capacious and dilatable, then because such heated Antimony has not only approached but become more approachable to a mean of Form, Force, and Character with Oxygen, the direct affinity appears, that is, strongly heated Antimony burns in Oxygen, as even unheated Antimony burns in Chlorine.

The plus and minus temperature of Chemicals, therefore, modifies their direct affinities because it modifies force, form, and character in Chemicals. The plus temperature starts and the minus temperature restrains the molecular motions of the oscillations of the force and form and character exchange in Chemicals; and the oscillatory dislocation passage and exchange and re-equilibration of the forces and forms between Chemicals amid all directly surrounding Ether constitutes Chemical action and combination.

In recapitulation. The direct Chemical affinity between Chemicals, that is, the proclivity on contact to Chemical action between them, exists when the mean equilibrium of forces, forms, and characters necessary for action and combination is high enough, and within exchangeable and oscillatory distance for all the actors, those obtrusively apparent and those more unobtrusively implicated—a phenomenon analogous to the striking distance of the electric spark. If you increase the distance the direct action or the spark will fail; if you lessen the distance, action or the spark will the more easily occur. Hence Chlorine more directly than Ozone, and Ozone more than Oxygen, will attack the heavier and less fusible Metals.

CHAPTER LVI.

VIOLENT AFFINITIES.

VIOLENCE of Affinity between actors is shown during action or combination, by intense fire, by intense or disguising matter transformations, by intense or hardly separable fixity of combination, and by the intense fewness of the compounds made from the violently affined. In shorter phrases Violent Affinity is correlated to fiery, to few, to fixed, to great metamorphosic or disguised combinations. The very violence of the action proves or shows the strength of the forces acting, shows that there must have passed during action exhaustive mutual force and form discharges between the actors, and the exhaustiveness in its turn leads to disguising metamorphosis, to fixity, to fewness of actions or combinations. In the Violent Affinities are concerned, therefore, the strongest actors of Chemistry. And the Mineral Earth, because she is our Greatest Chemical and is of vast continuity, and is heavyish and solid or cosmically cooled and contracted and conductive, becomes the strongest negative chemical Actor or form-contracting Force in Chemistry, and the Mineral Earth is, therefore, a party to the most violent Chemical Affinities ; and, indeed, it is chiefly the Elements whose combinations make the actual Mineral Earth herself that have mutually the Violent Affinities. The combination of Oxygen and Hydrogen into Water makes a large portion of the Mineral Earth. They as Water are the Mineral Earth. And although Oxygen and Hydrogen separated become Gaseous, or take a sidereal likeness, still they never lose their Affinity to the Mineral Earth's likeness since they exist as part of the Earth, stably, abundantly, and almost ubiquitously, as the Waters of the Earth.

In other words the affinity of Oxygen and Hydrogen is not only to each other, but more towards the mean Earth's force, form, and character; for it is those that mould the gases into the liquidity of the waters of the Earth. When separate and gaseous, the gases have the preponderating Sidereal equilibrium, for such an equilibrium is possible to them in their singleness. When mixed the Gases' character also become miscible, and then the Terrestrial equilibrium becomes urgent on them in their partnership; it becomes *most natural* to them to take the Earth's mean shape and force, that is, they are most prone to get cooled, contracted into their usual and most common watery liquidity. We see that the heat discharged in the formation of a drop of water will melt Iron and even Platinum, and we wonder less at this when we observe that the heat that the Oxygen and Hydrogen throughout the World get from the Sun and Stars, suffices to soften and dilate or to heat the great globe itself into its soils, strata, flora, fauna, and to melt it into its widespread and abounding waters. From the violence of the action of specks of Oxygen and Hydrogen in the laboratories, from the enormous expansion seen to have been lost in those actions by those small actors, and from the enormous contraction seen to have been gained in those actions by those small actors, we obtain a true conception of the vast heat or expansion that flows constantly into the whole globe from the Sun and Stars, *viâ* the vast amount of the cosmical Hydrogen and Oxygen; and a conception likewise of the vast cold or contraction that flows constantly from the vast Earth-globe, *viâ* the vast cosmical Oxygen and Hydrogen, to the Sun and Stars—a conception of the vast conflagration that attends the cosmical action of the cosmical Hydrogen and Oxygen—on our globe; or that attends the formation and maintenance of the Earth's soils, strata, flora, fauna, waters, airs, as long as the Earth's harder crust and periphery exist with its present character as a speck of Universe matter and force. For if the Suns were not, all the waters of the Earth would icify or freeze into the hardest of rocks; and if the solider Earth herself ceased being what she is, then the waters might gasify and decompose in the Sun's heat, into free Hydrogen and Oxygen, analogous to the matter of perihelion Comets.

When the Oxygen and Hydrogen of the laboratory combine, therefore, it is the Mean Mineral Earth that takes them back into her forces and forms. The Gases then contract greatly, and become part and parcel of the Mean earth, or they have the violent affinity, because in their combination the very strong Mean earth goes halves, and they discharge the hottest fire on earth that correlated to the oscillatory exchange of the greatest expansion force and form from the Gases, for the greatest contraction force and form, from the Earth, and they develop, therefore, the fire of the Oxyhydrogen blow-pipe, or of the amplest and highest oscillations. And they become much disguised or quite unrecognizable, water being born from them which is the only viable child or compound of its parents, the gaseous Oxygen and Hydrogen, howbeit a lusty child or a stable compound. When you try to decompose water, therefore, you try to sever its ingredients, the Oxygen and Hydrogen, from their preponderant union or equilibrium to the Earth, or from liquidity, and to give them a preponderant union or equilibrium with the sun or gaseity, and in that case you have a very great cosmical cold and pressure, that of the whole of the compacter Earth-globe, against you. It is, therefore, only drops of water from the vast Waters of the Earth that you can manage at all to decompose, and it being necessary to give to Water's ingredients the preponderance of the Solar force, for which both ingredients are apt, you must plunge into the water white hot Platinum. And for that small portion of water in which there is white hot Platinum there is preponderance of the Solar force. Such water no longer reposes as the natural Waters do on a vast surface bed of black hot or cold, solid crust, but on a white hot, platinal bed or crust surface, and for such a water drop, on such a bed, the liquid form of its ingredients is not possible, but only the gaseous or solar form—and consequently the Oxygen and the Hydrogen of such a water drop gasify or take the solar form, and water is said to be decomposed. In a minute spot of Earth, and in very minute portions of water, you establish a gaseous Hydrogen and Oxygen in a Solar equilibrium, an artificial equilibrium which a gentle push suffices to tumble into a Watery existence, or into the equilibrium which the rest of the Hydrogen and Oxygen on Earth possess, an equilibrium existence sustained in Water by mighty, constant, and omnipresent Forces.

The elements, therefore, that have specially the Violent Affinity in our laboratory are those which the Chemists themselves have deprived of the mineral Earth force and form and equilibrium, or of an Earth-like aspect. And the Violent Affinities are therefore mostly artificials or rarities in the perfectly natural state of things; for violence means great revolution or form change, and Nature does not intend to revolutionize or totally to change or destroy her works. In other words the elements that have the Violent Affinity can be found on the Earth herself, and their compounds are the stuff of which she is made. And Oxygen is their chief, and exists in this World both gaseous and solid, exists, therefore, in the positive or sidereal, and in the negative or terrestrial, equilibrium; and Oxygen is therefore apt for both equilibria, and is therefore most constantly oscillating up and down, or from Earth to Sky and from Sky to Earth; Carbon ranks next to Oxygen, and exists in this World both gaseous and solid, exists, therefore, in the positive or sidereal, and in the negative or terrestrial equilibrium; and Carbon, therefore, is also apt for both equilibria, and is therefore most constantly oscillating up and down, or in a see-saw, from Earth to Sky, and from Sky to Earth. Both Oxygen and Carbon, therefore, can oscillate freely from the contracted cold forms to the expanded hotter forms, and *vice versâ*, and by these oscillations, they work nobly for the Earth and Universe; for it is by the matter falls in force and form that expanding or heating work is done for this World, and by the rise in force and form it is that the contracting balancing cooling work is done for the Sun and the Stars, for ever and ever.

Oxygen, therefore, is the chief element possessing the violent affinity, and is ranged on the positive or sidereal side of matter; Silicon, the Metals of the *earths* and of the *alkalies*, the metals Iron and Hydrogen, are ranged, in inorganic chemistry, on the negative or terrestrial or planetary side of matter, and pair with Oxygen; and it is chiefly by this positive and these negatives that the Mean compacter Earth is built in her special Planetary Rank. And it is chiefly between *this* positive Oxygen, and these negatives, the metals and carbonoids, that the most Violent and Fixed Affinity appears—an Affinity not so much between those elements themselves as between them and the Mean of the Planet they constitute. If you separate Oxygen from these Metals or from Silicon then you do great violence to the firmly established Order of things on Earth—to the Constitution of the Globe; and it is this Order of things or Constitution, which we have called the Shapecraft of the Earth, that acting through the blendable Character of matter, reunites those severed but very fast friends—and no Special Occult Procrustean Attraction of their mere Atoms to each other. By Oxygen mixed with its close friends, we have matter capable of character blending, and potentially having weight, capacity, radiation, conducting plasticity, analogous to that of the compacter Earth, a matter that must tend, therefore, to take precisely the Earth-shape and force from the oscillations of the sidereal and terrestrial shine powers, or from the Shapecraft's forces. Consequently, between Oxygen and these Friends we have the most Violent, the most Fixed, the most Disguising, the most Exhaustive Affinity; an Affinity productive more of fire than of abundance of its correlated Morphigenic powers.

CHAPTER LVII.

CENTRES OF AFFINITIES.

Oxygen and Hydrogen can fetch Plus heat from the Suns, and can give this Heat to the Earth; and Oxygen and Hydrogen can fetch Cold from the Earth and can give this Cold to the Suns; Oxygen and Hydrogen can form the links for the plus and minus ethereal and ethero molecular oscillations, between the Suns and the Planet earth; and can be thrown into those shine fits of easy transmission and reflection described by Newton, or into the to-and-fro chemical waves between a Sun and Planet. And in this World Oxygen and Hydrogen can oscillate in Dayshine and Nightshine, between the Mineral, or the Carbon, Earth—and the Sidereal shine powers. And in these two situations Hydrogen and Oxygen must oscillate differently, for though the Carbon and the Mineral Earth have both negative Characters, still the two Characters differ much in the quality of their negativeness. Of the two earths, the Mineral one is the heavier, the larger, the more conductive, but much the less capacious and plastic; and the oscillations of Oxygen and Hydrogen with this Mineral Earth and the Suns take the shapes averagely of Water, but also of watery air, of mist, cloud, rain, snow, icerocks, hoar frost, and of the Hydrates, etc. These transforming oscillations, therefore, are more exhaustive than numerous, and indeed develop the great form-change and the heat that keeps the Globe moltened and seething, or partly gasified, and that is also observed now and then as lightning from the Sky waters, and as Volcanic Fire from the Earth's Crust.

The oscillations of Oxygen and Hydrogen with the Carbon Earth and the suns are much more numerous, or less exhaustive, for Carbon is all but the most capacious of the elements, and is also multiradiant and multiplastic, and light, and less conductive, and less extensive than the Mineral Earth. When, therefore, Oxygen and Hydrogen, helped by Nitrogen, oscillate with the Carbon-earth's shine and form powers, and the Sidereal shine powers, the Oscillations occur in by far the most capacious, the most radiant, the most plastic and light Matter, which is also partially isolated by inferior conduction and size; in such Matter, therefore, the Sidereal and the Terrestrial shine and form powers can accumulate in a homologous or scalariform manner, producing many matter shapes but less heat, producing the many moderately heated and formed Organic compounds instead of the fewer highly heated and formed Mineral compounds.

In Organic Chemistry many medium forms and much medium heat occur, but neither great Gaseity nor great Solidity, neither great Heat nor Cold. In Inorganic Chemistry, on the other hand, the forms are fewer, but more in extremes, and the Heat and the Cold present in them are also extreme.

For Chemical theory there is on Earth two chief centres of reaction to the Solar shine and form powers, or two chief centres of Earthly shine and form powers. And they are the Mineral Earth-globe itself, and Carbon and the Organic Carbon-masses.

The Solar Shine Power acts on the Earth-globe and on the Carbon and the Carbon-masses according to their Character, according to their capacity, plasticity, radiation, conductivity and weight; and the Sun will better act on that Matter or Globe which has the higher or the more metalloidal Character, or which has lightness, capacity, plasticity, and plus radiation—the Character best suited for the Sun's moulding guidance or actions.

The Earth-globe consists roughly of Silicon, the analogue of Carbon, and of the metals Hydrogen, Aluminium, Iron, Calcium, Magnesium, all combined with more or less of Oxygen.

The Carbon-globe consists roughly of Carbon, Hydrogen, Oxygen, Nitrogen.

Such are the two Matter-masses on this Planet that give the Reactive force and form throbs to the Solar force and form throbs, and that thereby evolve with the Sun, the ethereal and ethero molecular Oscillations that awake the shine and shapes, the loveliness and order in and around us, both in the Mineral and in the Organic Worlds.

The Earth-globe is vast, conductive, heavyish—is solid or cosmically cooled. The Earth-globe has a triple or a very strong form solidifying, contracting power over its Matter; and we accordingly see how the Earth-globe can icify or contract mineral gaseous Oxygen with Hydrogen, gaseous Oxygen with the fusible Silicon, and gaseous Oxygen with the fusible metals. But the very strength and size and conduction of the form contracting power in the Earth-globe cripples the dilatation powers of the form expanders of Earth, the Organic Gases, or hinders the Prolific Affinity, the assumption of a scale of slowly dilating forms by the Mineral Earth-mass, compared with the Carbon-mass.

The form Contracting power over Matter in direct [illegible] with Carbon's strain is also very great, but that [illegible] is modified by inferior conductivity and smaller [illegible] greater capacity and plasticity, and by the omni[illegible] of the Carbon-mass. In Carbon and the Carbon-[illegible] the localization of the shine and form Powers is [illegible], and its Scalariform development is attained by [illegible] and plasticity, and omniradiation, and the com[illegible] isolation of inferior conduction. The Carbon-[illegible] therefore, has the Prolific Affinity, or the Organic Compounds are more numerous than the Inorganic.

The fixed Inorganic Compounds have the contraction [illegible] Earth-globe, the strongest in Chemistry, to fix [illegible]. The stable Organic Compounds have chiefly the [illegible] of Carbon to fix them. Both the contractions [illegible] strong, but the inorganic is the larger, heavier, [illegible], and more conducting—the stronger, but the less [illegible]ically or Formatively perfect. And an Appeal from [illegible] Carbon contraction to the Earth-globe contraction is [illegible] possible on Earth; and on such an Appeal the [illegible] forms bound in the weaker Carbon Contraction [illegible] always be found less fixed than the stable forms [illegible] up in the Contraction of the Earth-globe. For all the [illegible] that exist in the Carbon World can exist also [illegible] World, but they cannot exist in both Worlds [illegible], for Carbon's Character differs much from [illegible] Character. By brute force, as it were, the [illegible] drives asunder the forces of the Carbon-[illegible] the Organic Forms passing from the grasp [illegible] forces to that of the stronger, passing from [illegible]lobe to the Earth-globe, often take the ex[illegible] and Forms; and in this passage, therefore, [illegible] often burn, Fire appearing as the equi[illegible] sacrificed, wasted Formative Force.

CHAPTER LVIII.

PROLIFIC AFFINITIES.

THE most wonderful of the Chemical Affinities is the Prolific one, and belongs by right of good character to the Group of the Organic Elements, namely, Carbon, Hydrogen, Oxygen, Nitrogen, while integrals of this Earth and her Solar system and the Universe, or while governed, or moulded, or chemicalized by the Shapecraft.

Chemical or Quintessential Form in matter may be considered as evolved out of the Contractions of solidity by the polar, homologous impregnations into them of the Expansions of gaseity, that is, by the action of Form Expanders on very contracted, but expansible Things. Analogously as the *Physiological Form* or the Plant grows or expands from a Small Seed in Dayshine and Nightshine, so I suspect that the Earth-globe itself, its Forms themselves, have grown in the Dayshines and Nightshines of the Universe, but only vastly more slowly.

And on this view of matter-shaping Carbon might be likened to the Mother Ovum, from the impregnation of which by Expansions all Organic Forms spring, grow, and expand. For we see Carbon very contracted in the Diamond and Brazilian *Carbonate*, and we can trace

Carbon gradually and homologously expanded throughout the Carbon or Organic Kingdom; and, finally, we find Carbon nearly in the utmost dilatation possible to Earth-matter when Carbon becomes part of Carbonic Oxide or of Marsh Gas.

Quintessential Form in matter, however, may be considered as evolved out of the Expansions of Gaseity by homologous grafts into them of the Contractions of Solidity. And on this view of matter-shaping, Hydrogen becomes the best Chemical at matter-shaping or evolution; for Hydrogen has the greatest Range of gaseity and the greatest of the storing Capacity, and the Conduction necessary for cooling and contracting or solidifying, or for taking the homologous grafts of Solidity.

But the fact is that neither the First nor the Second view of quintessential matter-shaping is singly exact. For in that matter-shaping there is always a double, reciprocal, Oscillatory action—Expansion, indeed, expanding contractions, but only while Contraction is oscillatingly, polarly, rapidly contracting expansion—the Two together, in Oscillations, in Ether and Ethero Matter, evolving Static Means between each other, by which the whole of the Homologous Series of the quintessential shapes of Earth arises, and is held oscillatingly stable by the planetary and sidereal or Oscillatory nature of the Shapecraft. But as Contraction is cold or a molecular centripetal force or motion, and tends to motion-stilling and inaction, or deathwards—while Expansion is heat or a molecular centrifugal force or motion, and tends to accelerated motions and activities or lifewards—the Expanding Force becomes the positive, the active, the masculine, the spermatozoidal, the father, the impregnating factor in matter-shaping—while Contraction is, as it re, the reactive, the negative, the recipient, the ninine, the ovular, the mother, the impregnated factor matter-shaping.

We repeat. The quintessential matter-shaping, there- e, is akin to begetting, or is a double, reciprocal, cillatory action of two forces, or two parents, a plus d a minus, an active and reactive, a spermatozoidal and ular, a father and a mother force or motion. And if seity and its analogues shape Solidity and its analogues, is because Solidity and its analogues polarly simul- neously reciprocate, and oscillatingly shape Gaseity d its analogues also.

With Gaseity, therefore, Chemistry quintessentially apes or chemicalizes or impregnates Solidity ; and nultaneously with Solidity, Chemistry moulds, en- afts, or chemicalizes Gaseity.

The whole of the quintessential forms of Earth range om Platinum to Hydrogen, namely, from extreme lidity to extreme Gaseity, or *vice versâ*. And we nceive that Hydrogen or Gaseity, and the forms between seity and Solidity or Platinum, could be produced from atinum or Solidity itself if it were only gradually heated expanded and lightened, fittingly and sufficiently. nd that Platinum or Solidity and the forms between atinum and Hydrogen could also be conversely pro- uced from Hydrogen or Gaseity itself, if Hydrogen were oled or contracted and weighted, fittingly and suffi- ently.

But in order to do this you must heat or cool matter, u must press and unpress it, in three ways. By anging the *Local* Heat or Cold and the *Local* pressing nd unpressing, for matter. By changing the *Cosmical* eat or Cold, the *Cosmical* pressing and unpressing, for matter. By changing the *Character* of Matter. You can heat matter in a Fire, you can cool it in a Freezing Mixture, and that is well known even to the rudest. I submit, however, that you heat matter *cosmically* by molecular contact with Gaseity, and you in like manner cool matter *cosmically* by Solidity—when you make matter act chemically together. And, moreover, you virtually heat or cool matter when you make matter *more* or *less* sensitive to Heat or Cold, or when you change the Character of matter.

Heat Sulphur *locally*, in a fire, or *cosmically*, with juxtaposed Oxygen—and Sulphur, in both cases, not only melts and boils but *allotropizes*, or changes character and aspects. Cool Sulphur, *locally*, by taking it off the fire, or *cosmically*, with a juxtaposed metal, and Sulphur, in both cases, not only condenses but *allotropizes* or changes character and aspects. The Formations and the Transformations of matter are all results of Heat and Cold—if you in your ideas of Heat and Cold take in the *Cosmical Heat and Cold*—Form in matter being itself static heat and cold, and pressing and unpressing in matter.

It is clear, therefore, that the strains of solidity and gaseity are the raw material from which Chemistry can develop the Forms of Earth. And to develop many Forms Chemistry must have plenty of the raw material, or a vast Range in solidity and a vast Range in gaseity. And in the Group of organic elements, Carbon, Hydrogen, Oxygen, Nitrogen, there does exist abundance of this raw material; the strains of the extremest gaseity and gasifiabilities on Earth, and the strain of the extremest solidity and solidifiabilities on Earth. For Carbon is very solid, but can likewise exist very gasified. Oxygen is very gaseous, but can likewise exist very solidified. And Oxygen and Hydrogen can exist in the middle form and in the confines of either the lower or the upper forms, and Nitrogen more specially in the higher Forms. Hence in Carbon, Oxygen, Nitrogen, Hydrogen, there is matter that can exchange force and form in wide amplitudes or that can burn; or matter that can exchange force and form in narrower amplitudes, developing more of forms and less of heat.

To Nitrogen in the Group of organic elements is allotted only the higher ranges of form of Earth. And Nitrogen being the vital element, *par excellence*, cannot exist in the more solid, heavy, deadened Forms of the mineral Earth. To Hydrogen in the mineral Earth is given the watery range of forms, the central form, touching the confines of the upper and lower forms by easily becoming steam and ice; and in the organic compounds Hydrogen occupies an analogous Form Position, and bridges the confines of the Carbon solidity and the Nitrogen gaseity, binding them towards the middle form with Oxygen.—It is evident, therefore, that the essentials of Quintessential Form-making are excellently arranged in the Group of Organic Elements. The ascent and descent of form or of solidity and gaseity, and the balance or tie between those forms, are amply provided for in this Group of matter.

Three of the four organic elements—Hydrogen, Nitrogen, Oxygen—are the light matter of Earth, the most molecularly and molarly mobile matter on Earth, but there is a heavier, slow moving organic element—Carbon —which is only *lightish*. For these elements are fitted to house the Vitalities of Earth, and those Vitalities do not admit the slowest nor the quickest molecular and molar motions of the Earth. In the four organic elements the storing capacity is the very highest on Earth, for the Sum of the four equivalents of substitution numbers of the four organic elements is only 16·7. Of the four organic elements, the Strain of Carbon is omni-radiant and somewhat conductive; Oxygen's is also potentially omni-radiant, but badly conductive; Hydrogen's is only plus-radiant, but somewhat conductive; and Nitrogen's is plus-radiant only, but badly conductive and light; and Nitrogen consequently is the Element which least identifies itself with the things and doings of the dead or mineral Earth; and Nitrogen as a chemical has been not a little reviled on these accounts;—nor is this without parallel in the social world. The strains of weight, capacity, radiation, in the group of the organic elements are excellent and most positive, and conductivity is alone inferior in this Group, whereby the group is better sheltered from the over-interference of the giant contracting powers of the Mineral Earth around them. That is, the Collective Character of the Group of the Organic Elements fits them to oscillate molecularly rather isolatedly, and in some independence of the commoner Earth, and in higher oscillation clefs or in higher ranges of forms; and in their own range or clefs the plasticity or the oscillation powers, the form and colour powers of the organic elements are the best on Earth.

CHAPTER LIX.

THE HOMOLOGOUS SERIES.

WE have argued that to shape matter Chemistry applies upon it, in varying preponderances, her contracting forces, which are the Earth's and Matter's gravity-pressure, and Cosmical Minus heat or Cold, or the Earth's Planetary or Minus shine powers; and Chemistry, at the same time, balances this contracting force by the expanding force of her Shapecraft, which is Plus heat or the Sidereal shine powers. And Chemistry applies this varied contraction and expansion on matter through the Character of matter, which Character itself varies with matter, and is farther capable individually of modifications.

Some qualities of matter which Chemistry has to shape, such as Carbon, contract readily and strongly in the Shapecraft; other qualities of matter, such as the Organic Gases, expand as readily and strongly in the Shapecraft. When Chemistry, therefore, needs the most expanded shape on Earth she subjects the Organic Gases free to the action of her Shapecraft; and when Chemistry needs the most contracted shape on Earth she subjects Carbon free to her Shapecraft; and whenever Chemistry needs the manifold shapes possible in matter between the extreme but plastic gaseity or expansion of the O

Gases, and the extreme but plastic solidity or contraction of Carbon, backed by the Mean earth, Chemistry mingles together, in infinite variety of proportions, the Organic Gases and Carbon, and subjects them to her Shapecraft. For by this mingling Chemistry modifies the Character of matter infinitely, and then the Shapecraft moulds that matter according to its modified and manifold Character, and expands or contracts matter stably, or allotropizes it into what is called the Organic Compounds, and, indeed, All forms and Compounds.

For we know, by what happens when Oxygen ozonifies, that it is enough to modify the character of Oxygen, that it is enough to make Oxygen dark radiant, to force it to contract, or to condense, and that such stable oxygenic condensation allotropizes or changes Oxygen into its Ozone Allotropy, which differs so much from Oxygen itself that Ozone preserved a long *incognito* to piercing eyes. But the condensing, ozonic modification of Character in Oxygen is analogous to that which is possible to Chemicals in contact or touch with each other, and which precedes and produces Chemical Action between them, and the action's form-changing or allotropizing effects on the chemicals. For this ozonic character-modification, this dark radiation or ozone-condensableness of Oxygen, is produceable in Air Oxygen because it is in contact and touch with that large, powerful chemical, the compacter Earth-globe, which has perfectly this condensing, ozone-inducting power over Air Oxygen, seeing that this great chemical, the compacter Earth, has already actually persolidified, liquefied, or much condensed the great majority of the Oxygen of the Earth within the Earth's Crust and Waters.

We perceive throughout all chemical compounds the contracting and the expanding Strain of the Shapecraft on their ingredients; and this is more unobtrusive in some mineral compounds, because the Mean earth herself, in these compounds sometimes is an ingredient—and in the tiny experiments of human Laboratories, the comparatively very large Mean earth must be a very unobtrusive dilating ingredient or dilator indeed.

The contracting and expanding Strain on the ingredients is better observed throughout the Organic compounds, for there the expansion and contraction are manifold, and act more by themselves in the exclusive Realm of Organic Matter, or in greater independence of the Mean mineral earth, and are the most perfect chemical expansions and contractions on Earth.

We observe, therefore, that the original or elemental Character of the organic ingredients, or what I have called their pedigree and strain, is perceptible throughout all their Organic Compounds. In other words, that the presence and increase of plus weight, plus dark radiation, plus conduction, plus capacity and plasticity in ingredients, give to them, from the Shapecraft, the contracting form and form pitch Strain in the organic compounds; while presence and increase of the minus weight, the minus dark radiation, the minus conduction, and the plus capacity and plasticity in ingredients give to them, from the Shapecraft, the expanding Strain in the Organic Compounds.

In the Ternary and Quaternary organic compounds, therefore, the presence and increase of Carbon with Hydrogen give the plus weight, the plus dark radiation, the plus conduction, or the negative or the contracting Strain on the form or form pitch in the compounds, while the presence and increase of Oxygen and Nitrogen give the converse, or the positive or expanding Strain on the form or form pitch.

In the Homologous Series of organic compounds, called the Monatomic Alcohols, and in all others, we observe the type of the Quintessential Form in matter, a form that not only has the great or major pitches of solidity, liquidity, and gaseity, but that has pitches within these states of matter—and it is, indeed, from the contemplation of these Homologous Series of organic compounds that the *conception of Quintessential Form itself* first arises and seizes the mind. In these series the Form rises in and *from* solidity to liquidity, *in and from* liquidity to gaseity, and in gaseity itself this Form rises to the confines of the gaseity of earth, or *vice versâ*—and not by any means abruptly, but scalariformly—just as the Spectrum and Spectral Force-pitches rise or fall—this Force and this Form being Cognates of each other.

In these Monatomic Alcohols the general Formula is $C_n\ H_{2n}+_{2}$ —O; and we take Hexyl in the series, and we find it a liquid, composed of $C_6\ H_{14}\ O$, and boiling at 150° C.

We have, therefore, in Hexyl the middle form or liquidity, but of a high pitch, Hexyl being a light liquid with a near boiling point or with nearness to gaseity. For the Aggregate Character of the oxyhydrocarbonaceous matter called Hexyl is such that the forces of the Shapecraft must fashion it into such a Form and Form pitch. In Hexyl's form there is the oscillatory balance of the centripetal and centrifugal motions or of contraction and expansion, that is, there is the form and colour pulse of matter—and the centripetal force in Hexyl's pulse is traceable to the Carbon and the Hydrogen in Hexyl, or rather to the plus weight, the plus dark radiation, and the plus conduction that these two elements bring to Hexyl—and the centrifugal force in Hexyl's pulse is traceable to its

Oxygen, which in the presence of Carbon tends to raise or expand the negative in compound forms, as is seen in Carbonic Acid and Oxide.

If we add in Hexyl ($C_6 H_{14}, O$), four equivalents more of Carbon, and eight of Hydrogen, we convert the alcohol Hexyl into the alcohol Decatyl ($C_{10} H_{22}, O$). But by thus increasing the Carbon and Hydrogen in Hexyl, or by converting it into Decatyl, we have increased the contraction power or strain in Decatyl compared with Hexyl. And if we contrast the Form pitch of Hexyl with that of Decatyl we find that it is actually so, for Decatyl is a liquid that boils, not at 150°, like Hexyl, but at the much higher point of 212°. The Form pitch of Decatyl is, therefore, lower than that of Hexyl, more contracted, harder to boil, farther from gasifying or gaseity, and thereby relatively nearer to the Solidity characteristic of the Strain and pedigree of the increased Carbon in Decatyl.

But as we know that only the change of the mere pitch in the gaseity of Oxygen is quite enough to change or to allotropize Oxygen into a seemingly different Substance, or into its Allotropy of Ozone, we may conclude that the mere change of the pitch in the liquidity of the oxyhydrocarbonaceous matter of the Monatomic Alcohols has sufficed to convert or to allotropize Hexyl into Decatyl, for Hexyl, Decatyl, and all the Monatomic Alcohols are *Exactly the Same matter in Quality.*

From Hexyl, in the Homologous Series of the monatomic alcohols, down to Melyl in the same series, the Carbon and Hydrogen are scalariformly increased, first in Heptyl, then in Octyl,—and soon, down finally to Melyl. And with this *increase* of Carbon and Hydrogen the Quintessential Forms in the alcohols become gradually more and more Contracted in Pitch, that is, become liquids that are more and more hard to boil, liquids, therefore, relatively more approached to Solidity—until in the monatomic Alcohol, Cetyl, ($C_{16}\ H_{34}\ O$), we actually pass from liquid matter to solid matter, but to a Solidity that is still relatively near liquidity, or that melts easily, or at 20°. And finally we reach in the series Melyl, ($C_{30}\ H_{62}\ O$), which has the *most* Carbon and Hydrogen, and which is, therefore, the *most solid* of the Monatomic Alcohols; for the Melyl solid melts only at 85°.

And from Hexyl, $C_6\ H_{14}\ O$, up to Methyl, $C\ H_4\ O$, in this series of Monatomic Alcohols the Carbon and Hydrogen are *decreased*, first in Pentyl, then in Tetryl, and so on; and although all these higher Alcohols are liquids, still their Pitch in liquidity *rises with the decrease* of Carbon and Hydrogen, or of the Contraction Strain in the Alcohols, so that Methyl boils the easiest or at 66°, or is nearest to a gas of all the Monatomic Alcohols.

By these Series of chemicals and by all other such series we see into the Mechanism of the Form-shaping in matter, and discover that it is simply an Allotropizing of matter. For if Matter, the same in quality, be altered in its form pitch, Matter assumes different aspects and properties, like the altered refrangibilities or pitches of Light or Colours and also those of Music.

And this form-pitch-change, this allotropizing change, is brought about on matter by Heat and Cold, but in the widest acceptation of the words, that is, by every guise of Heat and Cold; by the *local* Heat and Cold more obtrusively, but also by the *cosmical* Heat and Cold though more unobtrusively. For we submit that the gaseous Oxygen is as a natural Steam, or is as much *Cosmical* heat as the common Steam is *Local* heat; we submit that the hard, solid Carbon is as a natural Ice, and is as much

Cosmical cold as Ice is Local cold; that is, the *Local* and the *Cosmical* forces of Heat and Cold have parallel or analogous effects on matter; and as long as you heat or cool a Chemical by all the guises of Heat and Cold, Local or Cosmical, you can allotropize it, or change the Chemical's aspects and properties vastly. Contact with Ice, contact with Steam will so change Chemicals, and stably, or as long as the contact lasts; and analogously contact with the Oxygen Steam, and contact with the Carbon Ice, will also allotropize Chemicals, and also stably, or as long as the contact or combination lasts. And consequently all the forms and colours of the Earth are evoked, through Character, from a Matter that is ONE, and by the Enchanters, Heat and Cold — acting as a Pulse Motion, on Matter.

CHAPTER LX.

THE MAGNETIC AND ELECTRIC ANALOGIES OF CHEMICAL FORCE.

I CONCEIVE or assume that the whole matter of the Peripheral Earth forms a closely packed Plenum, or a continuous mass of Ethero Molecular Matter, pulsating, embedded in Ether; and that from the pressures and inductions of this Plenum not the *tiniest* Atomy in the periphery can escape. And we have a glimpse of this mutual pressure and inductions of ultimate Ethero Atomies, in the universal Impressibility of matter, and in Moser's images. We see this by the graduated continuity of the packing of the Earth's matter, from the Globe's crust Depths to its Air Heights, and *vice versâ*, and from the magnetic correlated packing of the Earth-globe's matters along its circles from Pole to Pole. In other words, you cannot modify either molar or molecular matter without inducing changes outside the modified matter. If you change, mechanically or chemically, the position or the bulk or the pulse pitch of any Atomy, on the periphery, you disturb not only the primarily changed Atomy, but the bulk and pulsation chain of surrounders, and everything thereto correlated; you produce Inductions in the Plenum, or dispositions in surrounding bulks and pulsations adaptive to the changes you have made; you disturb in the Plenum, Heat and Cold, Light and Shade, Plus and Minus electricity, South and North or Plus and Minus magnetisms, the Plus and Minus forms, and the dilating and contracting Chemic Forces.

A vast *omnipresent* and *omnipenetrating* Ethereal Medium involves and helps to blend the Atomies of the Periphery, involves and blends the Earth and Sun and sister Planets themselves as Atomies of Universe matter. Over this ethereal Medium Man has the least control. Man cannot perfectly shut it out from any thing or spot on Earth as he can shut out Airs, nor can Man quell it with ease. But over molar and over molecular *matter* embedded in this Ether Man has more control. Man can modify or can crush or expand more or less stably both the large matter masses and also the smallest by mechanical and chemical means, and he can cool or heat both the Molar and the correlated Molecular matter; that is, Man can increase or decrease locally the bulk and the pulse pitch of the Matter Atomies, but the Ether in which they are all embedded is more unquellable or is perfectly elastic, and takes and gives the motions and the spaces that decreased or increased Atomies lose or gain, like as the Airs do with the throbbings of tuned strings or bells, or with musical pulses. The Atomies of one matter have a compressibility to rubbing pressure that is proper to that matter wherever it be; but compressibility differs as matter itself differs, one kind of matter has Atomies more compressible than another. If you rub together two matters that are alike, the rubbing will compress the Atomies of both alike, and will develop smaller or minus Atomical formbulk and pulsation in the rubbed, but equal in both the rubbed; by diminishing the bulk and pulsation of Atomies in the rubbed you develop more room between the Atomies for ampler pulsations in the very elastic incompressible Ether around those Atomies. The Minus bulk and pulse are *localized* in the rubbed Atomies, and are, therefore, *latent* and *unobtrusive* as force; but the amplified pulses in the Ether around the Atomies are sensible, and being transmitted through the all-pervading brother Ethers, reach us, or thermometers, as Plus heat Oscillations.

If, however, you rub *two different matters* together, you compress their atomies *unequally*, and if the matter be bad conducting or hindered in Force and Form Equilibration with surrounders, then you get in one rubbed matter superficially and molecularly expanded form and pulse or Positive form and pulse, and in the other rubbed matter, you get an equivalent contraction or Negativeness of form and pulse—the Ether space between the rubbed Atomies remaining relatively the same—because if one set of Atomies have contracted, the other set have correlatedly dilated. The Plus and Minus form and pulse are *localized* in the actual rubbed Atomies by morphigenesis, and are latent or unobtrusive as force, and the Ether space being unchanged there is no difference in the Ether Pulse. When, however, the positive Atomy discharges its positiveness or dilated form into the negative or contracted form in Oscillations in the Ether between them, then an Electric Spark is seen and a Force and Form Equilibrium occurs between the rubbed matters themselves and the Plenum. It is quite analogous to the dislocation, passage and exchange of the morphigenic thermal Forces of Chemicals in action; but the form changes in friction electricity are superficial, molecular, and very small, and are therefore very unobtrusive.

In the packed pulsating pressure of the Plenum the rubbed expanded Atomy and the rubbed contracted Atomy, the Positive and Negative Atomy, will be pushed together or will seem to attract each other, amid the Ether of the Plenum. A dilated, bulkier Atomy in a pulsating packed Plenum, naturally dovetails into the hollow room made by the contraction of a negative neighbour Atomy. The ethero molecular pulsation in the Plenum is oscillatory, an advance or dilatation from the Sidereal Wave, and a recoil or contraction from the Earth Waves, and the advance or dilatation must alternate with the recoil or contraction. A dilated or Positive Atomy pulsating against another dilated Atomy, or a contracted or Negative Atomy pulsating against another contracted Atomy, pulsate against the order of pressures and of form and of pulsation of the Plenum, and meeting each other will not flow or oscillate like the generality, but will shock or repel each other.

When you in the Plenum disturb the pressure or form and pulsation Link in any of its parts, the disturbance tends to be propagated within a certain area in the Plenum, and this is called Induction. When you say that matter is Positively electrified in friction electricity, you mean that the superficial Atomies of that matter are pulsating more dilatedly and quickly than their neighbours in the chain of Plenum pulsations. And the Plus electricity in matter is therefore analogous to the Plus Heatedness, and the expanded formations in matter in Chemistry. And whenever the plus or Positive pulse and form is discharged into the minus the discharge is oscillatory or zig-zag and involves Ether, for which discharge the induction is but a preparation, and then Equilibrium in Pulse and Form occurs, not only between the discharges themselves, but also in the surrounders in the Plenum.

What most changes the expansion or contraction of matter, the Form and Pulsation in matter, is Chemical Action; and it is, therefore, from Chemical Action that the most abundant electricity is obtained. Galvanic electricity arises from the Oscillations of force and form between matter; on one side or pole of galvanizing action, a metal is reduced, and on the other side, a metal is metalloidized. The simplest galvanic cell consists of a cell of pure water with Potassium and Platinum in it, and galvanism is then produced by the metalloidation of the Potassium, and the reduction of the Hydrogen. Potassium in such a cell begins positive and expanded, and ends or changes into negativeness or contraction, whereas the Hydrogen begins negative or contracted, and ends or changes into positiveness or gaseity. And the Potassium and Hydrogen exchange Forces and Forms in oscillations during the galvanic actions; and this action is developed according to the equivalents or capacity, conduction, radiation and plasticity of the Actors, and might be considered as a heat and light action, but is much more than this or involves all the correlated forces, spectral force, electricity, magnetism, heat and light, cold and shade, chemical force or the expanding and contracting forces, etc., all these being guises or disguises of one Central Force or of each other.

From the rubbing of two different surfaces of matters, only a thin film of the surface Atomies is contracted in the one surface, and expanded in the other, and in direct opposition to the linked chain of Form and Pulse pressure on Earth.

Hence, although the Form and Pulse disturbance be small in friction electricity, it has the opposition of the surrounding Plenum, and can, moreover, induct on the Air's Atomies. Friction electricity, therefore, is urged strongly to an easier equilibrium by the agency of the Plenum, and is also dischargeable through the inductions in Air; in other words, friction electricity, though little, has great tension or Air inductive and disruptive equilibrizing power.

Galvanic electricity emanates from Chemical actions, involving liquids and metals, or occurs in Lower Pitches of electricity or of the Spectral Force which have less influence by induction over Air, or less disruptive power of discharge through Air.

CHAPTER LXI.

ATTRACTION IN CHEMISTRY.

If you adopt contraction and contractiveness and expansion and expansiveness in matter's ethero atomies as indicating electric negativeness and positiveness, then Carbon will electrically attract Oxygen, and in its turn Oxygen will attract Carbon. For Carbon is solid, hard, infusible, or has much contraction and contractiveness, or is very force negative; and Oxygen is soft, gaseous, and hardly liquefiable, or has much expansion and expansiveness, or is very force positive. And Carbon does attract Oxygen and all gases. Metals, being more contracted and contractible, will attract the metalloids which are more expanded and expansible, and *vice versa;* for the same reason acids attract bases, and the bases acids; metalloidicity and acidity are dilated and dilatable things, compared to metallicity and basity. Whenever these opposite classes of Chemicals touch each other upon the Earth's periphery, their Atomies are, by the pulsating pressure of the Plenum, pushed against each other and marshalled in the Ether, negative against positive, in perfect order of juxtaposition; the Atomies of the opposite actors seem *to* attract each other selectively. This selective attraction between Chemical actors, that as the first step for Chemical action, marshals all the Atomies of the negative actor close against those of the positive actor—is not a special attraction specially belonging to Chemistry, but is the attraction with which Electricity and Magnetism familiarize us. And even this attraction, so long as it is attraction, can do nothing beyond bringing about the closest juxtaposition of the mutually selecting Plus and Minus attractors. But when attraction has thus marshalled Atomies, it has given yeoman service to Chemistry. For such an attraction has given to matter the position and arrangement necessary for the character inductions, and for the subsequent force and form, oscillatory dislocation, passage, exchange, and re-equilibration between matter—which can best occur only in such marshalled juxtaposition of matter Atomies. The phenomena of force and form exchange between actors that follow on their selective attraction are similar in Chemistry and Electrics. In Friction Electricity the Heat and Light of the form and force Exchange is called a Spark; in sky electricity it is called Lightning; the form changes accompanying the electric spark are filmy and molecular and *high pitched*, and are unobtrusive, and even do not burn us much because of that high pitch; the form change accompanying lightning is the cloud fall from the sky transformed suddenly into rain on the Earth's surfaces; the form changes accompanying Galvanic Electricity are most obtrusive, for they are the familiar transformations of Chemical action—generally the reduction and metalloidation of metals in oscillations.

If I be in the right it is an established point that the sets of Chemicals that act and combine together Chemically are in opposite states of morphigenic thermal force, that is, of electricity, that is, of cosmical heatedness, that is, of form expansion, at the moment that they begin to act. After action and combination of the actors, after the electric, the thermal, the morphigenic discharges, the actors and dischargers, having obtained balanced, neutralized electric and morphigenic forces, lose completely their selective attraction to each other, since they lose its cause. And the combined actors then cohere, not by any special Chemical attraction, but through character, by all the morphigenic forces of the Shapecraft, in which, of course, are included the local and cosmical gravities or attractions of matter.

The attractions active in Chemistry, therefore, are two —the universal and permanent attractions.

And the selective, passing attraction, which is the Electric attraction.

And in Chemistry we try to relegate Attraction to its own spheres and proper duties—Duties that, though fewer than those expected from Attraction at present, are of signal importance or of essential nature for Chemistry.

CHAPTER LXII.

BAULKED in the aid of Man and of Human Laboratories, I have turned me, with Eyes and Mind that are at least patient and loving, to discern the Chemistry of Nature, and chiefly the Chemistry of the Suns or of Fire—for the Suns never set on the Empire of Chemistry—and shine for the good and evil, on the Great Chemists and likewise on the Smallest of the Sciolists.

ERRATA.

Page 220, line 19, for "two-fold by" read *twofold-*
" 250, " 16, for "Pathways of skies" re
the skies.

in Natural Chemistry. And my set task
by reasonings and observation, that this i
happening in Nature around us.

With the Dayshine and Nightshine a
Forces, Nature is constantly producing
or the formations and transformations
of the world around us, ever producin
the Spectral Force of this Earth,
light, cold, shade, the electricities,

Earth—all of which I have striven to construe into oscillatory motions in Ether and ethero molecular matter; motions exchanged between sidereal and planetary matters and their analogues, all matter being embedded in omnipresent and omnipenetrating Ether; motions between actives and reactives, which are best typified in those motions between airs and tuned matters, called music on Earth.

Toil-worn and toil-laden, unheeded, alone, I have thus striven—how feebly, I feel humbly, how passionately and patiently, however, I know also—I have striven to lay down the wide, firm, guiding principles alacking for Chemical Thought. For this has been with me the nagging, undying longing of a lifetime. And now or never more I offer the Rudiments of a Correlation Theory of Chemical Action and Affinity, based chiefly and consistently on chemical phenomena and forces known to experiment or observation. A Theory that endeavours to correlate the Acoustic, the Thermal, the Photal, the Electric, the Magnetic, and the Chemic Forces, construing them ultimately into pulsatile motions in ether and ethero molecular matter, or analogues. A Theory that tends to fuse matter itself into One, therewith and thereby constituting the endless Gamut of the vast Plenum of the One Harmonious Universe.

Before the appalling vastness of this noble Theme who is not downcast and humbled? And who more than myself? Howbeit, a very small spark may kindle a great and wide fire. And a Theory of Chemistry, if still unmade, may have (even in these Sciolistic pages) been spark-kindled or begun.

THE END.

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